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ELDORADO
ELECTRONICS

601 Chalomar Road Concord, California U.S.A. / Telephone: (415) 686-4200

OPERATING INSTRUCTIONS

MODEL 793
1 NANOSECOND
TIME INTERVAL COUNTER

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MODEL 793
1 NANOSECOND
TIME INTERVAL COUNTER

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IMPORTANT

MAINTENANCE INFORMATION

This instrument contains a cooling fan and air filter to maintain optimum performance of the unit in various ambient environments. The air filter must be removed and cleaned once every 60 days so that air flow will not be restricted. After cleaning, the filter should be coated with an adhesive such as R.P. Filter Coat. More frequent cleansing of the filter element may be required when the instrument is operated in unusually severe environments.

MODEL 793 1 NANOSECOND TIME INTERVAL COUNTER

SECTION 1

SPECIFICATIONS

DECADES	Up to 9 decades, 6 decades standard.
DISPLAY	Inline Nixie[R] tubes with fixed decimal point and polarized window filter.
RANGE	1 nanosecond to 1 second or less, depending on number of decades.
QUANTIZING RESOLUTION	1 nanosecond with no ±1 count quantizing error.
MINIMUM INTERVAL	1 nanosecond.
ACCURACY	±0.5 nanosecond, ± oscillator stability.
START-STOP CHANNELS	
Attenuator Switches:	Positive or negative polarity, with X1 and X10 attenuation.
Impedance:	50 ohms nominal.
Amplitude:	±1 to ±100 volts. Maximum instantaneous overload to ±40 volts on X1 range, and ±200 volts on X10 range will not damage inputs.
Slope:	0.2 volt per nanosecond or faster. Slower rise times will trigger the instrument but proportionally degrade repeatability.
Polarity:	Positive or negative, selectable by the front panel attenuator switches.
Input Coupling:	Direct coupled on positive polarity, AC coupled on negative polarity.
Connectors:	GR Series 874, located on front panel.
Lockout:	Additional pulses on either start/stop line will not affect previous reading. Instrument must be reset before measurements can be made.

[R] Burroughs Corporation

TIME BASE

Frequency:	Start channel, 10.0 Mc; Stop channel, 10.1 Mc.
Stability:	5 parts in 10^6 short term. 1 part in 10^4 long term.

RECYCLE RATE

Low:	Display control sets variable display period of 0.1 to 10 seconds or infinite. Automatic reset occurs at end of variable period.
High:	Successive readings can be made at rates up to 10 Kc using remote reset input.

RESET

Manual:	Front panel pushbutton.
Remote:	2 to 10 volt positive pulse, 1 microsecond minimum rise time, through rear panel BNC connector.
Automatic:	Reset occurs automatically at end of 0.1 to 10 second variable display period.

TEST PULSER

Amplitude:	(+) 10 volts, ±4 volts, 30 microseconds after reset occurs.
Pulse width:	8 nanoseconds.
Rise time:	2.5 nanoseconds (10 to 90%).

PRINTOUT

Levels:	1-2-4-8 BCD; DC levels, "0" = (-)0.5 volts nominal; "1" = (-)5.0 volts nominal.
Connector:	Amphenol #57-40500 (Female).
Print command:	(-)5 to 0 volt step, rise time less than 0.5 microsecond, 470 ohm source impedance. Signal returns to (-)5 volts at reset.

TEMPERATURE	10°C to 50°C.
PHYSICAL	
Front Panel:	Brushed aluminum.
Dimensions:	5 1/4" High, 19" Panel, 17" Wide, 19" Deep.
Weight:	35 pounds.
POWER	115 vac, 50/60 cps, 85 watts; oscillator oven power, 25 watts (additional).

SECTION 2

APPLICATIONS

2.1 GENERAL

The Model 793 1 Nanosecond Time Interval Counter effectively measures intervals from 1 nanosecond to 1 second, depending on the number of decades provided. The measurement is made from the interval between START and STOP control pulses, each of which is connected to the instrument on separate control lines. Polarity of these control signals may be either positive or negative as selected on front panel control switches. These same switches also provide for X1 and X10 attenuation of the input signal.

The Model 793 utilizes lower speed circuitry (10 Mc) with a special interpolating technique to achieve better accuracy and reliability, in addition to eliminating the normal ±1 count quantizing error. This error, normally encountered in other instruments, is not present here. This is due to the phase locked memory in the START/STOP channels. Each memory effectively causes any measured time interval to be referenced to a common starting point on each of the clock signals, thereby eliminating the usual quantizing error associated with non-phase locked systems. With this capability, many types of mechanical and electrical measurements may be made with the Model 793, some of which are briefly discussed here. In each example, the item of prime interest is the time interval between initiation and termination of the event.

2.2 APPLICATIONS

ELECTRICAL PHENOMENA

Model 793 may be utilized to determine pulse delay in a cable or delay line, and can accurately resolve pulse duration down to 1 nanosecond. System pulse jitter measurements may be performed on such installations as radar, navigation and computer equipments. When operated in conjunction with Eldorado's Model 402 Phase Measurement Unit, precision phase measurements can be made with resolution down to 3 nanoseconds.

When used with Eldorado's Model 611 Stabilizer Unit, the Model 793 long term stability is limited only by the accuracy of the external frequency standard connected to the Model 611. Also, Model 793 may be incorporated into radar or navigational systems for direct reading of target or position data. Calibration of these systems by TIM methods is rapidly becoming a standard procedure in the industry today.

Other important uses of this instrument include laser/maser research and development, and high resolution nuclear time of flight studies. In addition, all of the measurements mentioned can be expanded to include the effects of temperature, humidity, vibration, variations in line voltage and others.

MECHANICAL PHENOMENA

High or low speed shaft rotation and high speed camera shutter measurements using phototube techniques, or the study of gaseous and liquid dynamics are other examples of applications for Model 793.

Muzzle and ballistic velocity, acceleration timing of test vehicles, or shock wave data from laboratory and field experiments may be accurately measured and the results read directly by the operator. In addition, solid or gaseous explosive burning rates may be determined with equal precision. Other applications of the type indicated presently exist for this instrument. As technology continues to advance in various fields, instruments such as Model 793 will find wide and very commonplace usage.

SECTION 3

OPERATING INSTRUCTIONS

3.1 GENERAL

The Model 793 Time Interval Counter is a solid-state instrument designed to measure and display intervals down to 1 nanosecond while at the same time maintaining over-all ±0.5 nanosecond accuracy. Readings are in microsecond units. The visual readout consists of from 6 to 9 display tubes and a fixed decimal point mounted behind a polarized viewing screen.

Front panel functions include START/STOP input signal connectors and polarity/attenuation switches, a **TEST** pulse output connector, oven light indicator for the START/STOP oscillators, manual RESET pushbutton, DISPLAY control to adjust the readout display period from 0.1 to 10 seconds, and the POWER switch.

Functions on the rear panel consist of START/STOP oscillator frequency adjustment potentiometers, RESET input connector for operation up to 10 Kc, PRINT COMMAND output connector, PRINT OUTPUT connector with 1-2-4-8 BCD levels, NORMAL/CALIBRATE slide switch for instrument calibration, and a Fixed Delay box normally attached to the rear of the instrument, except when operating in conjunction with the Model 611 Stabilizer Unit.

The Model 793 contains START and STOP oscillator circuits which are temperature stabilized in a special oven. The oven heating element is connected directly to the power cord and bypasses the main power switch. Under normal conditions, it is desirable to have the oven fully stabilized at all times by leaving the line cord connected to a power outlet. When installing Model 793 for the first time, allow at least 1 hour for the oven to stabilize before the instrument is turned on.

3.2 INPUT SIGNAL CONNECTIONS

In the nanosecond time measuring range, an examination of START/STOP signal rise time, slope, and amplitude characteristics should be made before operating the instrument, to insure correct readings. The Model 793 input control circuits are designed to operate in two ranges of ±1 to ±10 volts and ±10 to ±100 volts. Maximum instantaneous overload to ±40 volts on the X1 range, and ±200 volts on the X10 range will not damage the inputs. For highest accuracy, the input signal slope should be 0.2 volt per nanosecond or faster, however, slower rise times will trigger the instrument but proportionally degrade repeatability.

After each measurement, the instrument must be reset before another reading can be made. This is due to a lockout feature on the START/STOP channels that is actuated as the START/STOP signals are received. When the lockout circuit is operating, additional or random signals on the input lines will not affect the previous reading. Another feature of the interlock circuitry prevents the STOP channel from triggering before the START channel without placing any limitations on the minimum measurable time interval of less than 1 nanosecond.

The Model 793 START/STOP input circuits must be connected into a 50 ohm matched system using General Radio Series 874 connectors. Normal control channel input is from 2 separate cables, one for the START signal, the other for the STOP signal. In some cases, it is possible to utilize START/STOP signals from one input line if they are of opposite polarity and both channels are fed from a 50 ohm matching transformer Tee.

When the START/STOP polarity switches are in the Plus position, the input trigger level in nominally (+) 410 millivolts at 25°C with a negative temperature coefficient of (-)5 millivolts per degree C. The dc trigger level for Minus switch positions is lost due to inverter transformer coupling. Input resistance of the START/STOP channels is 50 ohms in the Plus position and 5 ohms in the Minus position. The latter value is due to an inverting transformer which is connected to the input of each line when the respective polarity switches are in the Minus position.

3.3 INSTALLATION

a. Connect the line cord to a 115 volt, 50/60 cps power source. Allow the START/STOP oven to warm up at least one hour before operating the instrument.

b. Connect the START/STOP input control cables to the front panel GR 874 Series connectors. Provide 1 to 100 volt control signals of either polarity for the inputs with the START/STOP attenuator polarity switches set accordingly. The input pulse slope should be 0.2 volt per nanosecond or faster with an input impedance of 50 ohms nominal.

c. If REMOTE RESET is desired, connect this function to the rear panel BNC connector marked RESET. Provide a positive 2 to 10 volt pulse, with a 1 microsecond minimum rise time. Successive readings can be made at up to a 10 Kc recycle rate.

d. OPTIONAL: Connect the printer input cable to the rear panel Amphenol connector marked PRINT OUTPUT. The printer output code is 1-2-4-8 BCD from a 10 K ohm source, "0" = (-)0.5 volts nominal; "1" = (-)5.0 volts nominal. SEE SECTION 5, DRAWING INDEX AND DRAWINGS, for Printer Readout Connector Pin Designation information. A PRINT COMMAND step level of (-)5 to 0 volts, with less than 0.5 microsecond rise time is available on a rear panel BNC connector.

e. Check the rear panel slide switch marked CAL/NORM to be sure it is in the NORM position prior to taking measurement readings.

3.4 OPERATION

a. Turn the POWER switch to ON. A random display will immediately appear on the readout tubes. Check the front panel oven indicator light for cycling; thus, indicating that the oven temperature has stabilized.

b. Check the START/STOP input switches to verify proper polarity and attenuator settings.

c. Depress the RESET button. All readout tubes will reset to the zero condition. A REMOTE RESET signal should produce the same result.

d. Introduce START/STOP control signals to the instrument. With the front panel DISPLAY control set in the extreme clockwise position, the visual reading will remain until the unit is reset. The variable display period of 0.1 to 10 seconds is also dependent on the adjustment of this control. Any signals arriving on the START/STOP control lines after the first STOP pulse is received will have no effect due to the lockout feature. If a STOP signal arrives before the START signal, the instrument will not count until it is reset and the cycle repeated in the proper sequence.

e. In order to synchronize the MODEL 793 with incoming control pulses, the front panel TEST pulse may be used to either initiate the event or serve as the START reference signal. This pulse appears 30 microseconds after the completion of instrument reset.

f. OPTIONAL: Manually or automatically actuate the external printout equipment upon completion of the readout cycle. The Printer readout should exactly duplicate the visual display readout. Automatic command signals are available from the rear panel BNC connector marked PRINT COMMAND.

3.5 SIMPLIFIED OPERATING DESCRIPTION

When making time interval measurements, the operator is interested in the time between the initiation and termination of an event. In most time interval counters, the output of a high accuracy oscillator is gated ON at the beginning of the event and OFF at the end of the event. During the gate ON period, each output cycle of the oscillator is totalized on the readout indicators. The higher the oscillator frequency used, the better is the resolution of the measurement.

Normally, design of a 1 nanosecond time interval counter by standard techniques would require a 1 gigacycle (10^3 Mc) clock generator, a high speed gate, and a 1 gigacycle decimal counting unit. This could be done in the light of today's technology with questionable field reliability, but even then, readings from such an instrument would be accurate to only ± 1 nanosecond.

The Model 793 utilizes lower speed circuitry with a special interpolating technique to achieve better accuracy and reliability, in addition to eliminating the normal ± 1 count quantizing error. This error, normally encountered in other instruments, is not present here. This is due to the phase locking memory in the START and STOP channels. Each memory effectively causes any measured time interval to be referenced to a common starting point on each of the clock signals, thereby eliminating the usual quantizing error associated with non-phase locked systems.

Referring to Block Diagram C-3-2236, the Model 793 measurement cycle begins when a signal arrives at the input of the START channel. Due to the special design

of the 10 Mc clock and its combination with a memory element, 100 nanosecond clock signals are produced which are precisely phase locked to the start signal. These signals are totalized in decimal counting units No. 3 through 9. No information is fed to No. 1 and 2 decimal counting units until receipt of the stop signal.

When the stop signal arrives, it inhibits Gate G1, thus turning OFF the 10.0 Mc START channel clock pulses being totalized in decimal counting units No. 3 through 9. The same stop signal simultaneously phase locks the 10.1 Mc STOP channel clock through its input memory circuit. This clock produces square waves of 99 nanosecond duration. These pulses are fed through Gate G2 to decimal counting units No. 1 and 2 until the picosecond coincidence circuit G3 senses coincidence between the 10.0 Mc and 10.1 Mc signals. When this happens, picosecond coincidence circuit G3 inhibits Gate G2 and the number of 10.1 Mc clock pulses generated betwen the stop signal and coincidence are displayed on No. 1 and 2 decimal counting units. The result is that DCU's No. 1 and 2 display the number of 1 nanosecond time intervals, by vernier interpolation, while DCU's No. 3 through 9 display the number of 100 nanosecond time intervals in real time. The reading on the visual display tubes is the total number of nanosecond time intervals indicated in microsecond units.

If a stop signal arrives at the same time a 100 nanosecond clock pulse is present, an additional count could be added, in error, to the reading in DCU's No. 3 through 9. To compensate for this, a special interpolating logic circuit is included to remove the possibility of any such ambiguity.

Model 793 utilizes the frequency vernier interpolation principle where the difference in time between the last counted 10.0 Mc START channel clock pulse and the last counted 10.1 Mc STOP channel clock pulse is reduced by 1 nanosecond for every cycle of the 10.1 Mc STOP channel clock until coincidence is reached. A direct analogy to this technique is that of the machinist's vernier measuring scale where it is possible to interpolate between graduations on parallel scales to a 2 or 3 decimal place accuracy.

Discrete time intervals may be repetitively counted in the Model 793 without any change in the last digit occurring. For instance, a time interval between 3.0 and 3.5 nanoseconds always reads 3.0 nanoseconds and if the time interval increases just beyond the 3.5 nanosecond point, the instrument will always read 4.0 nanoseconds. The reading error of any measurement thus never exceeds 0.5 nanoseconds.

A Test Pulser produces an output test pulse 30 microseconds after each reset pulse. This pulser is designed to be used directly with the instrument for self check, or is a convenient pulse source for passive delay measurements.

The optional Model 611 Stabilizing Unit is an optional refinement which is available to insure long term stability of the Model 793. An external or internal high precision 1 or 10 megacycle oscillator may be used as the reference source of the Model 611. Digital phase memory and phase control circuits accurately maintain any arbitrary phase difference between the precision reference and the Model

793 10.0 Mc oscillator. Accuracy of the time interval measurements then depend only on the stability of the high precision reference source. Thus, with a 1 part in 10^9 or better external reference oscillator, the nanosecond accuracy can be maintained out to a measurement interval of 1 second.

SECTION 4

CALIBRATION

4.1 GENERAL

The Model 793 Time Interval Counter needs only minimum maintenance, however, normal aging of electronic components occasionally requires that instrument calibration be checked to verify specification accuracy. Therefore, general calibration procedures are included in this section as a guide to restoring the instrument to optimum performance.

4.2 TEST EQUIPMENT

Model 793 calibration procedures are not complex but do require special test equipment. If the equipment listed below is not obtainable for these procedures, it is recommended that the instrument be returned to the factory for complete certified calibration.

The following equipment is required for Model 793 calibration.

a. (1) 10 Centimeter Air Delay Line, General Radio Model 874L10.

b. (1) 20 Centimeter Air Delay Line, General Radio Model 874L20.

c. (2) 30 Centimeter Air Delay Line, General Radio Model 874L30.

d. (1) Tektronix Transformer Tee-Model 017-012.

e. (1) Variable Air Delay Line, 4 nanoseconds, Eldorado Model 620 or equal.

f. (1 Set) Matched 50 ohm Cables with GR Series 874 Connectors.

g. (1) Adjustable Delay Box, range 0 to 200 nanoseconds in 1 nanosecond steps.

h. (1) Precision Time Base Generator with no more than 50 picoseconds of jitter in 10 milliseconds, Eldorado Model 615 or equal.

4.3 TIME BASE ACCURACY

TEST

This procedure is designed to verify Model 793 compliance to time base accuracy specifications. Long and short term stability is checked by measuring delays generated in the Eldorado Model 615 Precision Time Base Generator, (or equal). Stability of this equipment must be at least 1 part in 10^7 per day, with accuracy of $\pm$0.5 nanoseconds.

a. Connect the Model 793 to Model 615 or equal, as shown in Figure 1. Turn Model 793 and Model 615 power ON, allow one hour for warmup.

b. Set the Model 793 controls as follows:

POLARITY/ATTENUATOR SWITCHES; START (+)1, STOP (-)1.

DISPLAY; Infinity, (extreme clockwise).

c. Set the Model 615 controls as follows:

SAMPLE; Mid-range, Fast or Slow.

OSCILLATOR (Rear Panel); Internal.

TIME BASE CONTROLS (Short Term Stability); Set the time base to 1,000,000 nanoseconds. Over a period of one hour the Model 793 readout should not vary more than ±5 nanoseconds. Cable lengths to the START/STOP inputs must be equal.

TIME BASE CONTROLS (Long Term Stability); Set the time base to 10,000 nanoseconds. Over a period of 24 hours the Model 793 readout should not vary more than ±1 nanosecond.

CALIBRATION

If the results from the above procedure indicate that Model 793 is not exhibiting the proper stability or accuracy, the following calibration procedure should be followed in order to restore the instrument to optimum performance.

a. Power Supply - It is essential that power supply output voltages be checked before proceeding with adjustment of the START and STOP oscillators. All power supply voltages are measured at the output side of the fuse block located on the middle chassis. If any voltages do not check within the tolerances indicated below, the respective power supply trimpots will require adjustment.

ADJUST SEQUENCE	VOLTAGE	REGULATION
1	(-)6 volts	±1%
2	(+)6 volts	±1%
3	(+)30 volts	±1%
4	(-)30 volts	±10%

(-30 volt supply is non-adjustable.)

b. Should power supply trimpot settings be moved in any way, it will be necessary to, first, repeat the procedures given in SECTION 4.3 before

proceeding to final adjustment of the START or STOP oscillators.

4.4 START OSCILLATOR CALIBRATION (LONG TERM STABILITY)

TEST
When verifying long term stability of the Model 793 START oscillator, the two extreme right hand digits are not significant in the adjustment and therefore, should be ignored.

a. Connect the Model 793 to the Model 615 or equal, as shown in Figure 1. Turn Model 793 and Model 615 power ON, allow one hour for warmup.

b. Set the TIME BASE CONTROLS of Model 615 to 100,000 nanoseconds. The reading on the Model 793 should indicate 100,000 nanoseconds ±5 nanoseconds.

CALIBRATION

a. If the Model 793 does not consistently indicate a reading of 100,000 nanosecond, ±5 nanoseconds, then set the Model 615 TIME BASE CONTROLS to 10,000,000 nanosecond setting and adjust the rear panel START oscillator potentiometer until this reading, ±100 nanoseconds is obtained.

b. Monitor Model 793 stability for 30 minutes following this adjustment, then set the Model 615 TIME BASE CONTROLS to 100,000 nanoseconds. The maximum allowable error under this condition is ±1 nanosecond.

4.5 STOP OSCILLATOR CALIBRATION (QUANTIZING RESOLUTION)

TEST
The purpose of this test is to verify if Model 793 meets the quantizing error specification of ±1 count. The technique used is based on the known delay in variable and fixed length coaxial air delay lines.

a. Connect the Model 793 as shown in Figure 2. Turn Model 793 power ON, allow one hour for warmup.

b. Set the Model 793 controls as follows:

DISPLAY; Turn to minimum display time when Model 793 TEST pulse is utilized. Turn to infinity if external pulser is used.

POLARITY/ATTENUATOR SWITCHES; Set switches to (+)1 position when Model 793 TEST pulser is used. If an external test pulser is used, set these controls to be compatible with the input pulse characteristics.

c. Set the Adjustable Delay Box and the Model 620 Variable Air Delay Line to the point where a transition of the least significant digit is ob-

served; for example, where the number 14 changes to 15. Note this position on the Model 620 calibration dial. Then advance the Model 620 through to the next transition where the number 15 changes to 16, then note this position on the calibration dial. Next, adjust Model 620 to an approximate midpoint between these positions. In this condition the number 15 will be represented.

d. Add 30 cm air delay lines, one at a time, in series with the STOP channel. Discrete one nanosecond increases should be registered on the Model 793 readout; thus, verifying the quantizing resolution of the instrument. (The delay of a 30 cm fixed air delay line is 1 nanosecond.)

CALIBRATION

Should recalibration of the quantizing resolution become necessary, first, be sure that the START oscillator stability is within the specifications outlined in SECTION 4.4.

a. With the Adjustable Delay Box and Model 620 still connected in the STOP channel circuit, manually sweep the Delay Box selector switch between 100 and 120 nanoseconds. Check the Model 793 output readings to insure that as the selector switch is moved from point to point these readings are consistent with the selected delays. Should the readings skip, or other inconsistencies arise, it will be necessary to repeat the procedure described in TEST paragraph 4.5c except this time, the Adjustable Delay Box and the Model 620 are set at the 115 nanosecond midpoint setting.

b. Now set the Adjustable Delay Box and the Model 620 for the midpoint setting of 105 nanoseconds. Adjust the STOP oscillator (rear panel potentiometer marked STOP) so that the 105 nanosecond midpoint occurs in the same region ($\pm$0.2 nanoseconds), as the 115 nanosecond midpoint.

c. Repeat the procedure in CALIBRATION paragraph 4.5b except, this time, set the Adjustable Delay Box and Model 620 at the 15 nanosecond and 5 nanosecond midpoints. Re-adjust the STOP oscillator as required. Optimum adjustment of the STOP oscillator is best verified by cross-checking between the high and the low delay ranges indicated.

4.6 ZERO CALIBRATION

The purpose of this procedure is to adjust the Model 793 readout for a zero indication. This adjustment must follow the oscillator test procedures since the zero setting is dependent on START/STOP oscillator calibration.

a. Connect the Tektronix transformer Tee from the Model 793 front panel TEST connector to the START/STOP channels. Turn Power ON, allow one hour for warm-up.

b. Set the Model 793 controls as follows:

DISPLAY: Turn to minimum display time if Model 793 TEST Pulse is utilized. Turn to infinity if external pulser is used.

POLARITY/ATTENUATOR SWITCHES: Set switches to (+)1 position when Model 793 TEST pulser is used. If external test pulser is utilized, set these controls to be compatible with the input pulse characteristics.

c. Adjust the two potentiometers* located on the middle card chassis so a reading of zero is obtained when a 10 centimeter Air Delay Line is inserted in the STOP channel. A 1 nanosecond reading will be obtained when a 20 centimeter Air Delay Line is inserted in the same channel.

4.7 FACTORY REPAIR SERVICE

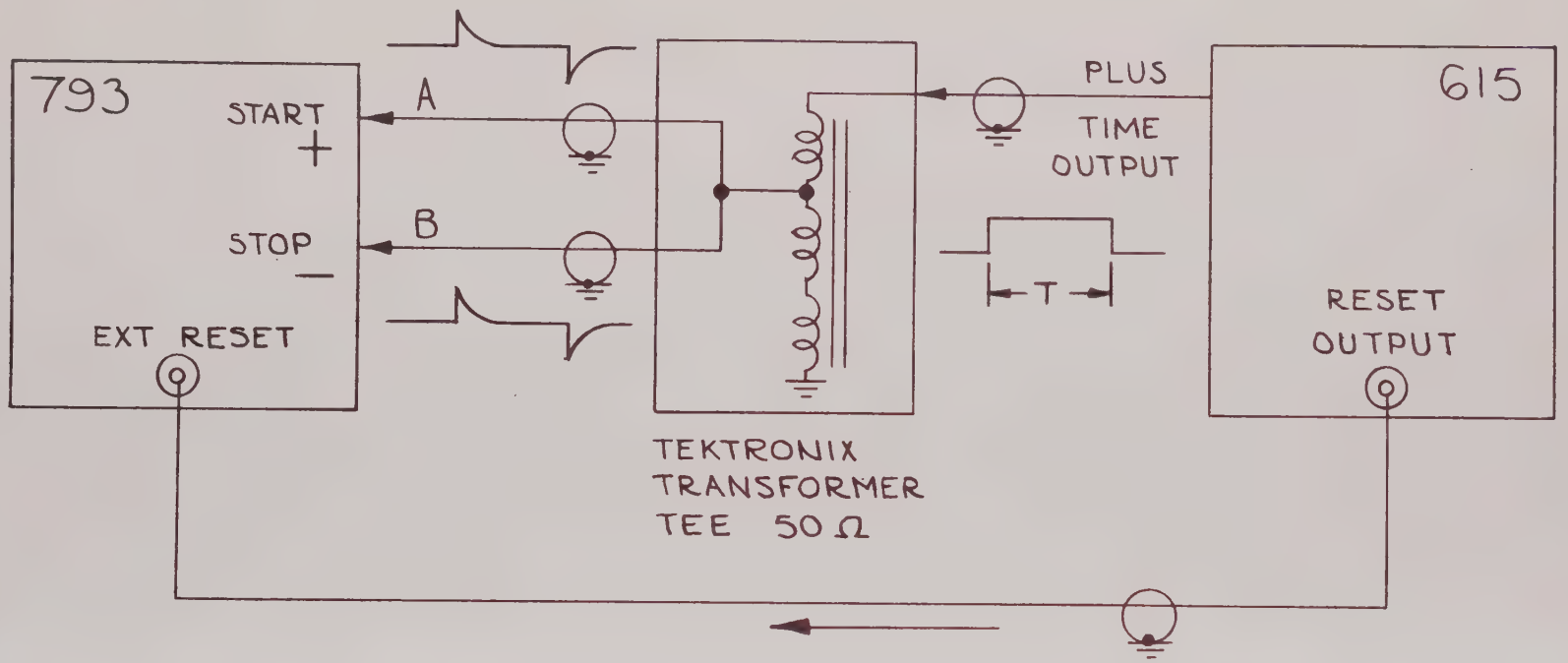
In the event that any Eldorado equipment requires service and trained personnel or test equipment are not locally available, we recommend that your nearest Eldorado Sales/Service representative be contacted for information and instructions. He will make every attempt to place the equipment back in good operating condition or, he may suggest that it be returned to the factory for more extensive work. Eldorado's Customer Service Department is always prepared to supply repair parts and service for any of its instruments. Equipment sent to the factory for service is usually returned to the customer within two weeks after it is received. Address all inquiries for parts and service to Eldorado Electronics, Customer Service Department, 601 Chalomar Road, Concord, California (94520).

PARTS ORDERING INFORMATION
When ordering parts for an Eldorado instrument, specify the following information for each item ordered:

a. Model and Serial No.

b. Complete Part Description including; the Assembly Designation, Part Designation, and Part Number.

* On Model 793 instruments, Serial #126 and above, one of these potentiometers has been moved to the front panel to facilitate occasional zero readjustment. Thus, it is not necessary to follow the full test procedure indicated above providing the zero adjustment remains within the range of this potentiometer. Zero shifts up to about $\pm$ 1.5 nanoseconds caused by aging or temperature changes can be easily readjusted without affecting the accuracy or calibration of the instrument.



CABLE LENGTHS A & B SHOULD BE EQUAL TO WITHIN ± 1.00".

UNLESS NOTED:
ALL RESISTORS ½W. ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
.001μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG. CHNG.	BY	DATE

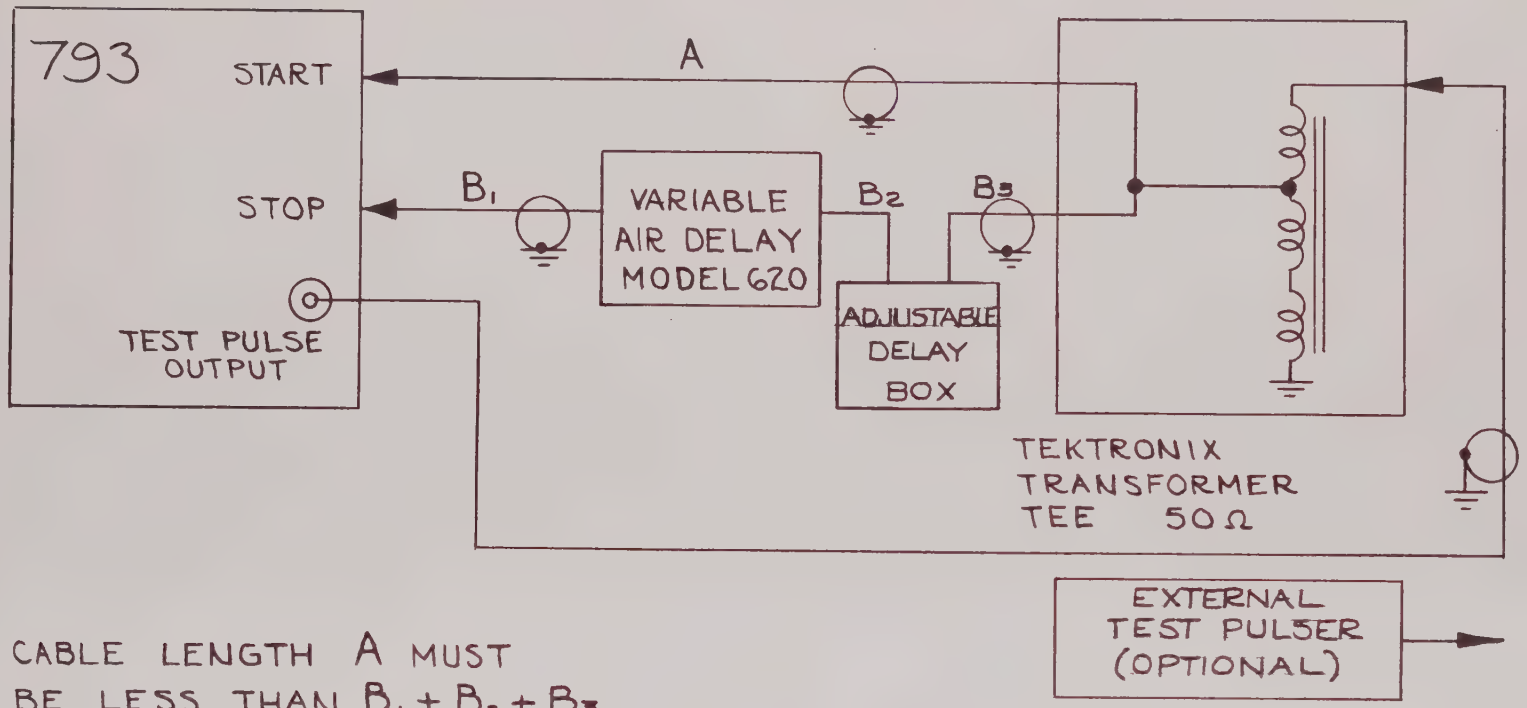
Eldorado Electronics
Berkeley, California

DRAWN BY: G STARR	DATE 11-15-63
CHECKED: RSchx.	DATE 3-6-64
APPROVED:	DATE 3-6-64

793 TEST PROCEDURE
FIGURE "1"

DWG. NO. A-11-2595 | ISSUE

MODEL
793



CABLE LENGTH A MUST BE LESS THAN $B_1 + B_2 + B_3$

UNLESS NOTED:
ALL RESISTORS ½W. ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
$\mu\mu = p = 10^{-12}$
$.001\mu = n = 10^{-9}$
$\mu = 10^{-6}$
$m = 10^{-3}$
$K = 10^{3}$
$M = 10^{6}$

DWG. CHNG.	BY	DATE

Eldorado Electronics
Berkeley, California

DRAWN BY: G STARR	DATE 11-15-63
CHECKED: K Schn.	DATE 3-6-64
APPROVED: PJ	DATE 3-6-64

793 TEST PROCEDURE
FIGURE "2"

DWG. NO. A-11-2594 | ISSUE

MODEL 793

SECTION 5

DRAWING INDEX AND DRAWINGS

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3) Model 793 - Wiring Diagram D-3-2800

4) Start Input - Schematic Diagram C-3-2240

5) Stop Input - Schematic Diagram C-3-2244

6) Interlock Logic - Schematic Diagram C-3-2379

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8) Add One Logic - Schematic Diagram D-3-2422

9) S-71A-1 10 Mc DCU - Schematic Diagram D-3-2389

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12) S-73 100 Kc DCU - Schematic Diagram C-3-1253

13) Reset Circuit - Schematic Diagram D-3-2433

14) Test Pulser - Schematic Diagram C-3-2375

15) Power Supply - Schematic Diagram C-3-2616

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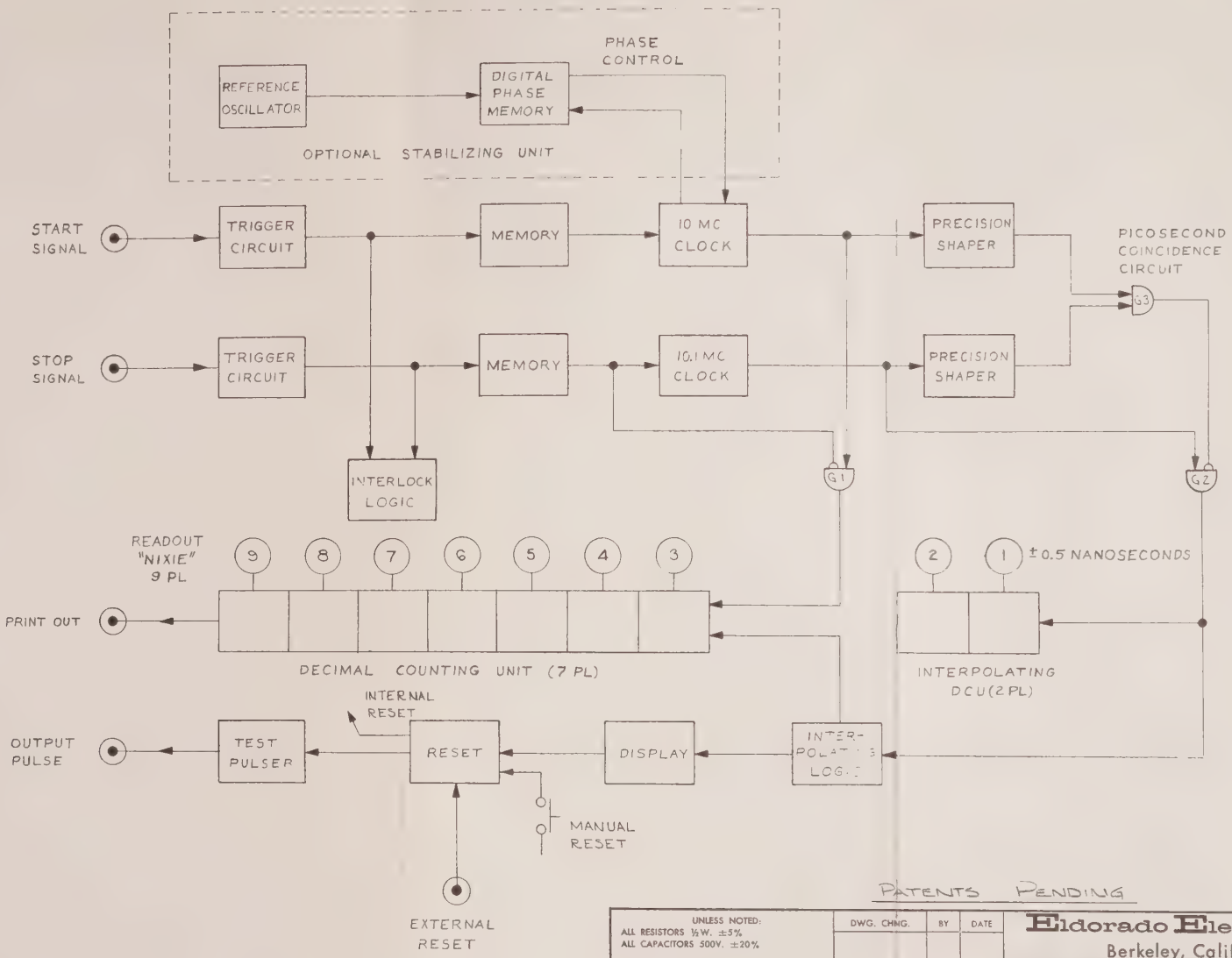
17) Minus Regulator - Schematic Diagram B-3-2246

18) Above Chassis Cabling Diagram C-2-2617

19) Printer Readout - Connector Pin Designations



PATENTS PENDING

UNLESS NOTED:
ALL RESISTORS ½W. ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
.001μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG. CHNG.	BY	DATE

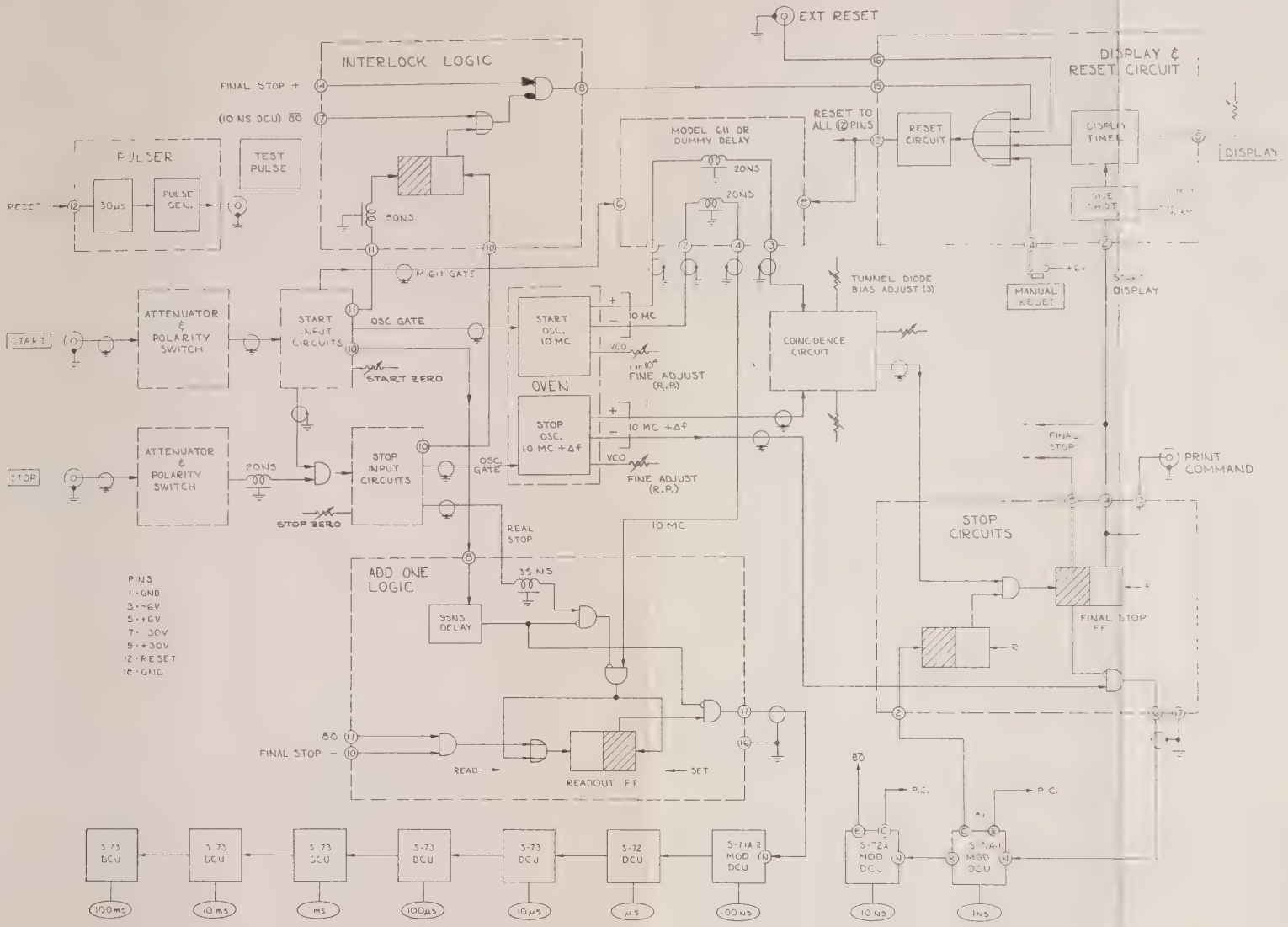
Eldorado Electronics
Berkeley, California

DRAWN BY [illegible] DATE 4-15-63
CHECKED: [illegible] DATE 5-[illegible]-63
APPROVED: [illegible] DATE

SIMPLIFIED BLOCK DIAGRAM
MODEL 793

DWG. NO. C-3-2236 ISSUE

MODEL 793



PATENTS PENDING

FINISH	DWG CHNG	BY	DATE
	ECO 1188	BCB	1-20-64
MATERIAL			
TOLERANCE UNLESS NOTED ± .00 = .015 HOLE DIA .005 .000 = .005 ANGLES 1°			

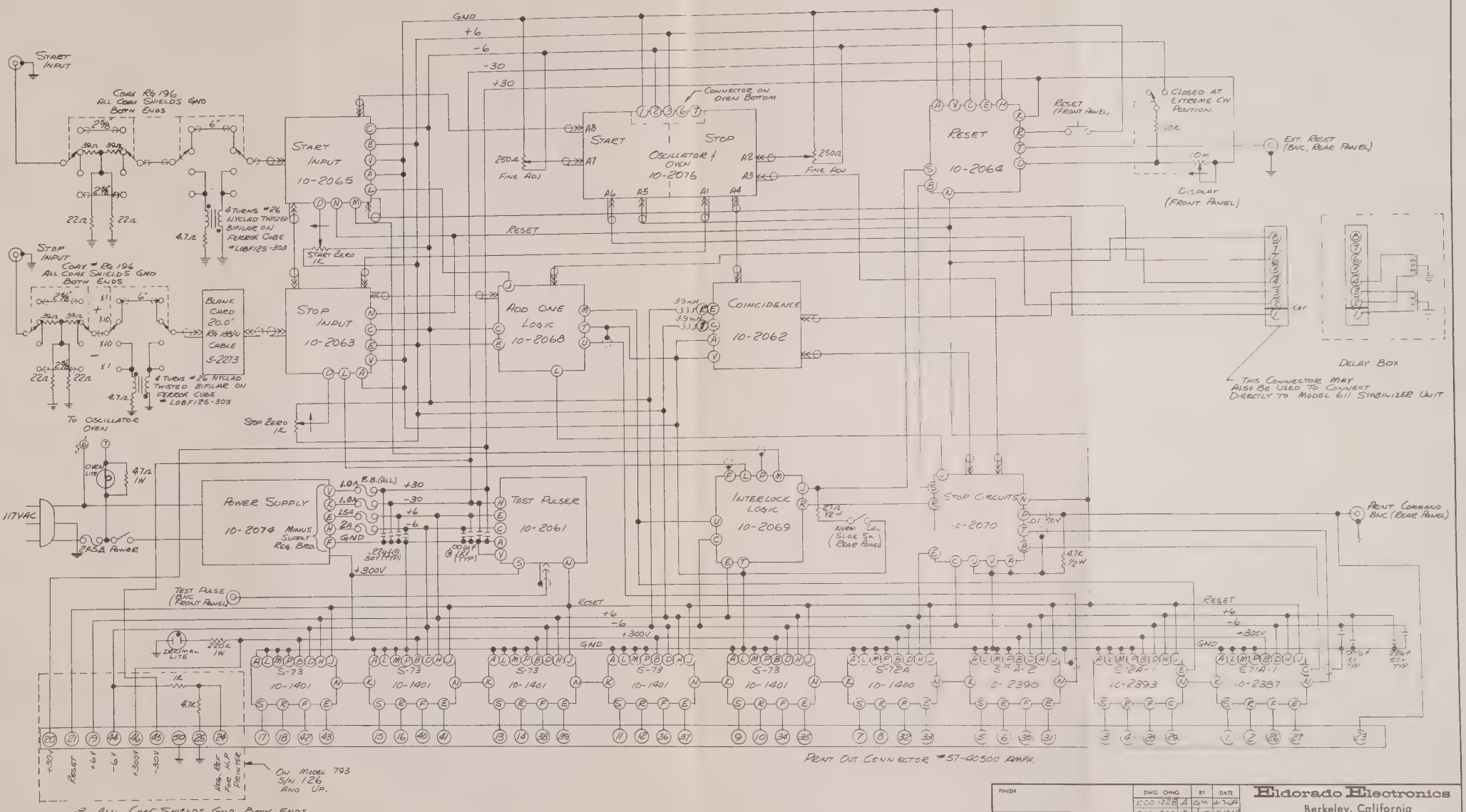
Eldorado Electronics
Berkeley, California

DRAWN BY J. STARR	DATE 11-13-63	DO NOT SCALE THIS DRAWING	
CHECKED	DATE -20-63		
APPROVED	DATE	SCALE	

BLOCK DIAGRAM - 793

DWG NO D-3-2582 | ISSUE

MODEL 793



3. ALL COAX SHIELDS GND BOTH ENDS.
2. ALL CAPACITORS AS SHOWN.
1. ALL RESISTORS ¼W, ±5%

NOTES: UNLESS OTHERWISE SPECIFIED.

DWG CHNG		BY	DATE
ECO 1228	A	GM	4-7-64
ECO 1300	B	JAE	5-18-64

FINISH

MATERIAL

TOLERANCE UNLESS NOTED ±
.00 = .015 HOLE DIA .005
.000 = .005 ANGLES 1°

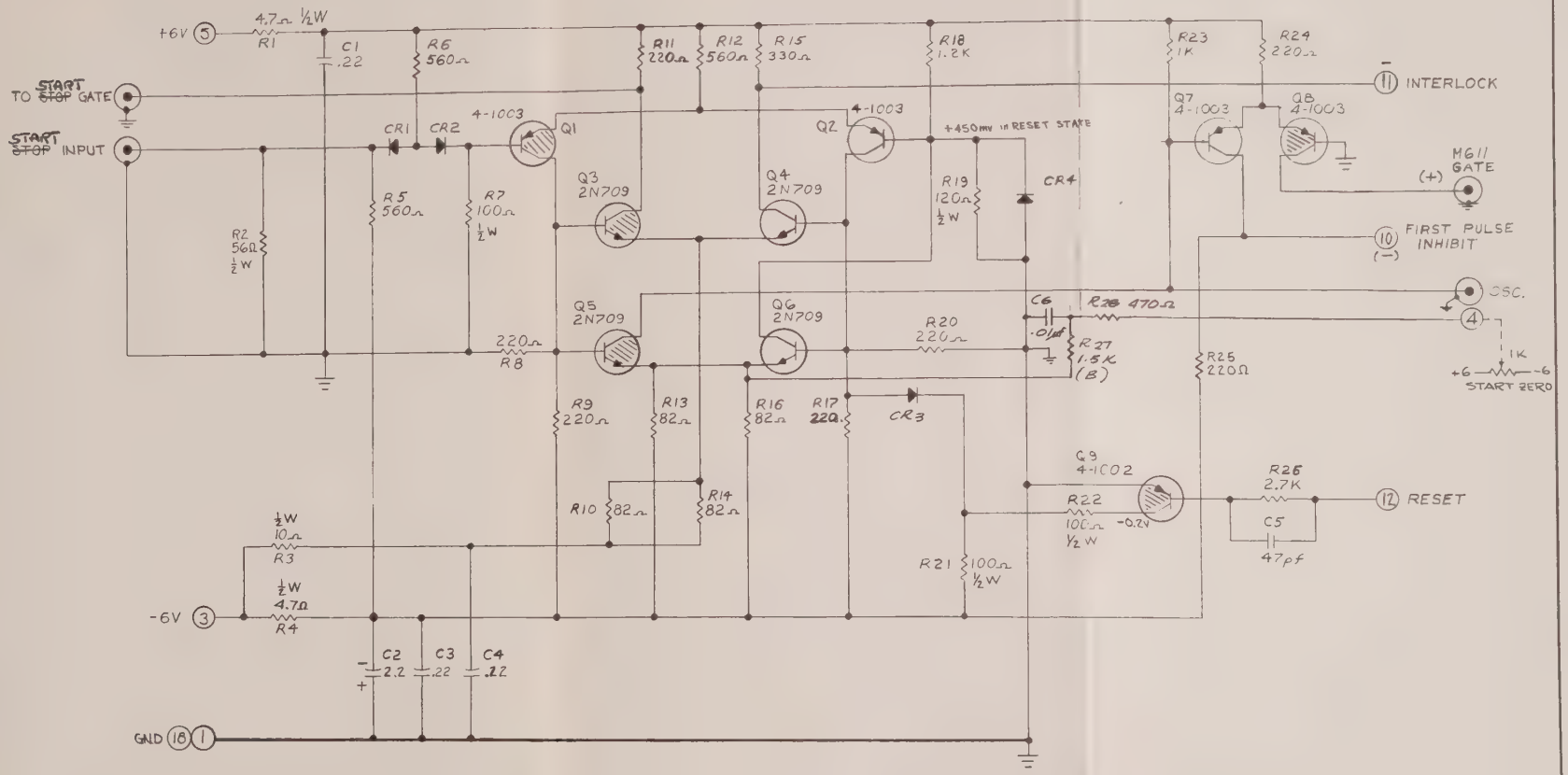
Eldorado Electronics
Berkeley, California

DRAWN BY J. Impson	DATE 2-20-64	DO NOT SCALE THIS DRAWING
CHECKED Hal Young	DATE 2-20-64	
APPROVED P.J.	DATE 2-20-64	SCALE NONE

WIRING DIAGRAM- 793

DWG NO C-3-2800 ISSUE B

MODEL 793



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL OUTPUTS MUST BE TERMINATED INTO PROPER LOADS FOR CIRCUIT TO OPERATE.
2. ALL DIODES CDG2G7
3. ALL RESISTOR VALUES IN OHMS, ±5% ¼W.
4. ALL CAPACITOR VALUES IN MICROFARADS, ±5%, 300V
5. ⊗ REFERS TO PCB CONNECTOR PIN DESIGNATION

R	C	CR	Q	L
28	6	4	3	0

UNLESS NOTED:
ALL RESISTORS ½W. ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
.001μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG. CHNG	BY	DATE
ECO 1150	RS	11-11-63
ECO 1188	RCE	1-20-64

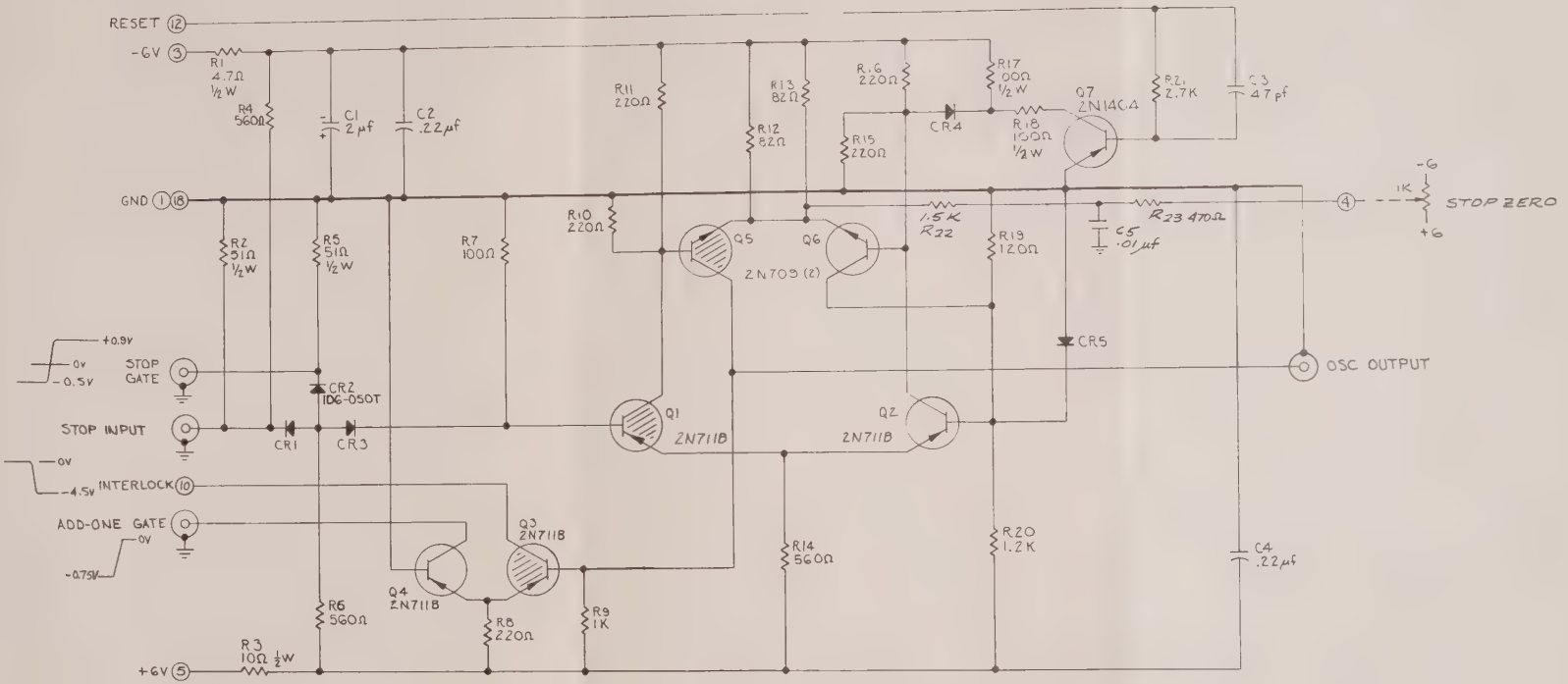
Eldorado Electronics
Berkeley, California

DRAWN BY:	DATE 8-16-63	P/L
CHECKED:	DATE 9-10-63	10-2065
APPROVED:	DATE	

START INPUT

DWG. NO. C-3-2240 ISSUE A

MODEL 793



NOTE:

ALL OUTPUTS MUST BE TERMINATED INTO PROPER LOADS FOR CIRCUIT TO OPERATE.

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTORS ¼W, ±5%
2. ALL CAPACITORS 300 V. ±5%
3. ALL DIODES CD 6267
4. (X) REFERS TO PCB CONNECTOR PIN DESIGNATION

R	C	CR	Q
23	5	5	7

UNLESS NOTED:
ALL RESISTORS ½W. ±5%.
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
.001μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG. CHNG.	BY	DATE
ECO 1150 A	R.S.	11-20-63
ECO 1188	RS	1/20/64

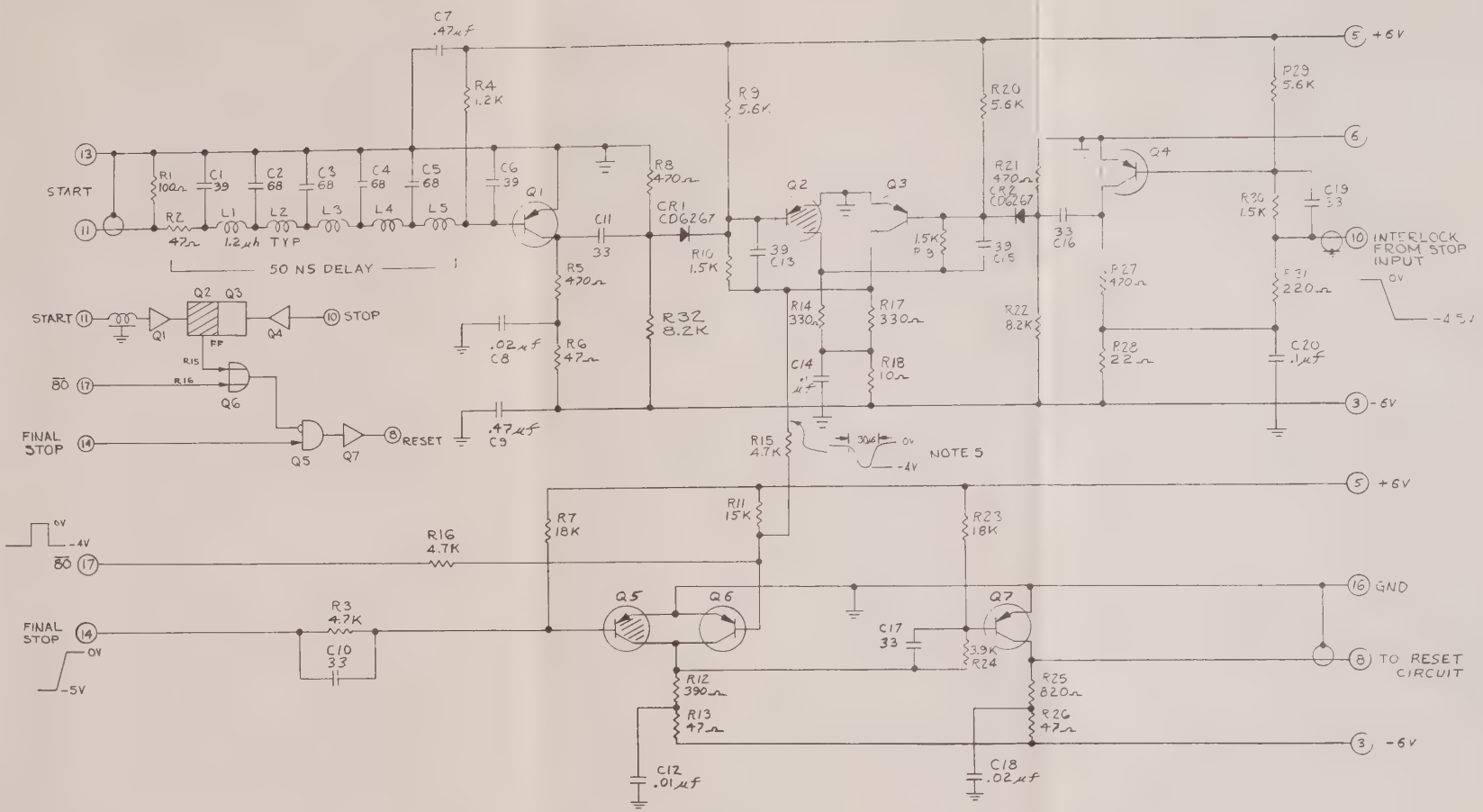
Eldorado Electronics
Berkeley, California

DRAWN BY: G. STARR	DATE 10-8-63	PL 10-2063
CHECKED:	DATE 11-15-63	
APPROVED: P.Y.	DATE	

STOP INPUT

DWG. NO. C-3-2244 ISSUE A

MODEL 793



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ¼W, ±5%
2. ALL CAPACITOR VALUES IN PICOFARADS 500V, ±5%
3. ALL TRANSISTORS 2N711B
4. ⊗ REFERS TO PCB CONNECTOR PIN DESIGNATION
5. WAVEFORM FOR T=0 (SIMULTANEOUS START-STOP INPUT)

R	C	CR	Q	L
32	20	2	7	5

UNLESS NOTED
ALL RESISTORS ½W. ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
.001μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG. CHNG.	BY	DATE

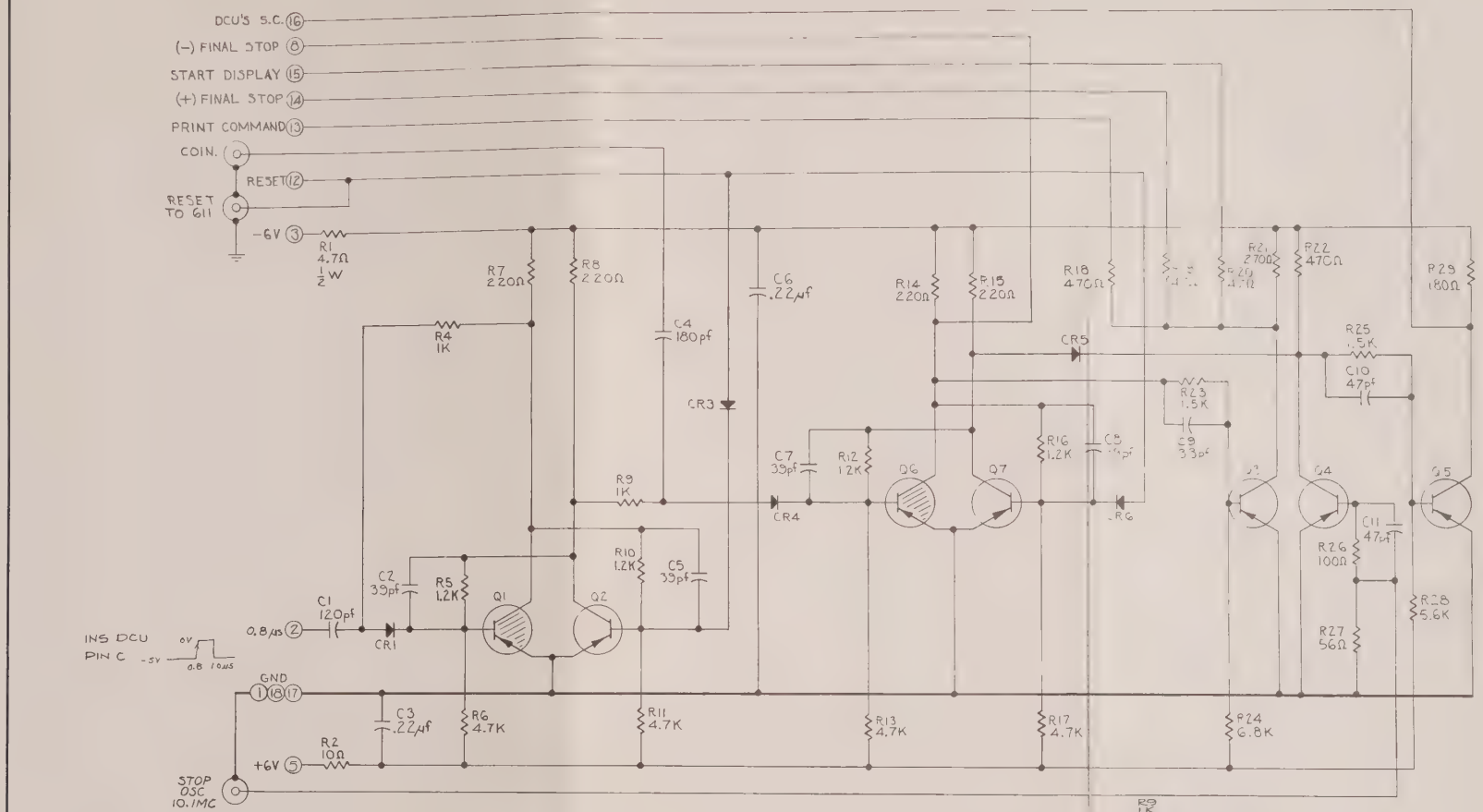
Eldorado Electronics
Berkeley, California

DRAWN BY: R. P.	DATE 8-23-63
CHECKED: [illegible]	DATE 9-1-63
APPROVED: P.G.	DATE

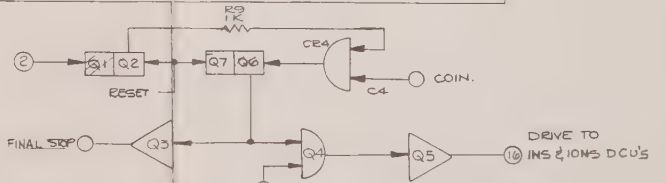
INTERLOCK LOGIC

DWG. NO. C-3-2379 ISSUE

MODEL 793



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ¼W, ±5%
2. ALL CAPACITORS 300V, ±5%
3. ALL DIODES CDG2G7
4. ALL TRANSISTORS 2N711B
5. Ⓧ REFERS TO PCB CONNECTOR PIN DESIGNATION



R	C	CR	Q
30	11	6	7

UNLESS NOTED
ALL RESISTORS ¼W ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
001μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

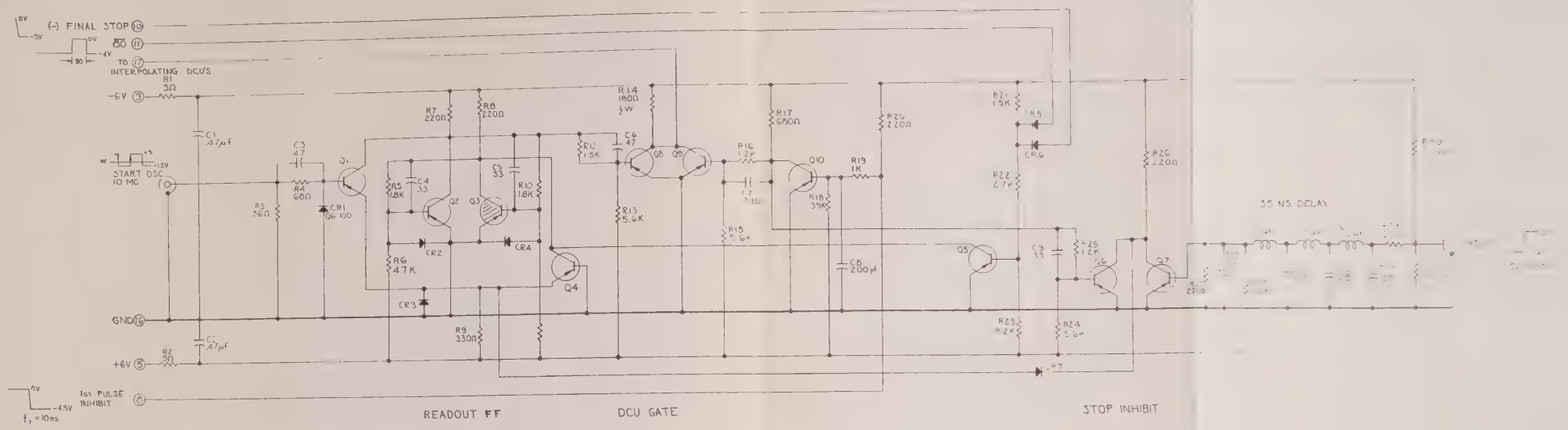
DWG CHNG	BY	DATE

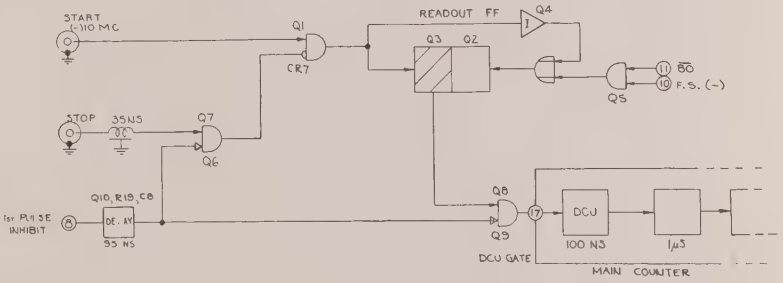
Eldorado Electronics
Berkeley, California

DRAWN BY: G. STARR	DATE 10-10-63	PL 10-2070
CHECKED:	DATE 10-20-63	
APPROVED: R.L.	DATE	

STOP CIRCUIT

DWG. NO. C-3-2380 | ISSUE | MODEL 793



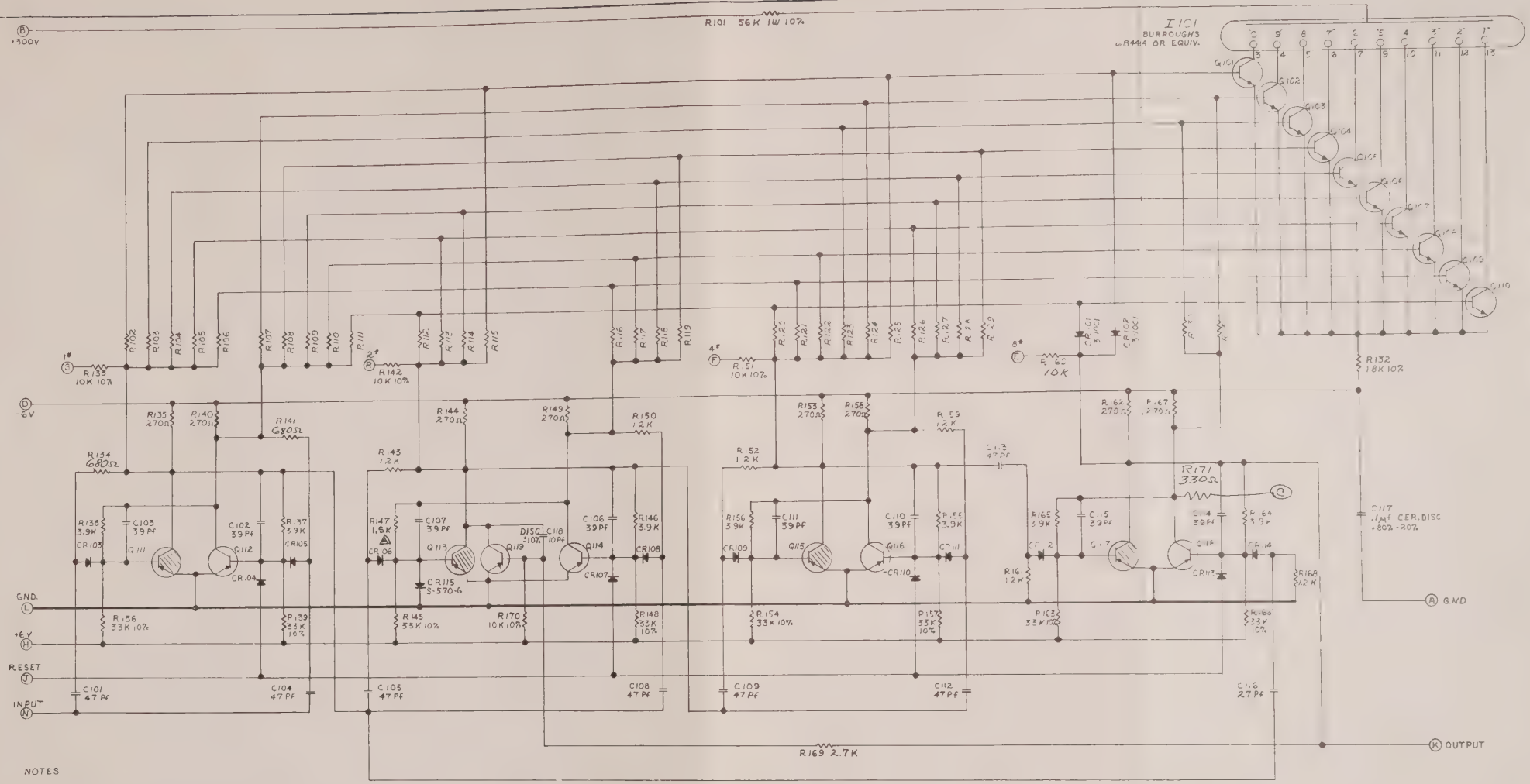


NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ¼W, ±5%
2. ALL CAPACITOR VALUES IN PICAFARADS 300V, ±5%
3. ALL TRANSISTORS 2N711B
4. ALL DIODES FDG267
5. (X) REFERS TO PCB CONNECTOR PIN DESIGNATION

REF PL 10-2068

UNLESS NOTED: ALL RESISTORS ½W, ±5%, ALL CAPACITORS 500V, ±20%	DWG CHNG.	BY	DATE	Eldorado Electronics, Berkeley, California
UNITS IN Ω, F, & H; μμ = p = 10^{-12}; .001μ = n = 10^{-9}; μ = 10^{-6}; m = 10^{-3}; K = 10^{3}; M = 10^{6}				DRAWN BY: [illegible] DATE: [illegible]; CHECKED: [illegible] DATE: [illegible]; APPROVED: [illegible] DATE
				ADI SNE LOGIC; DWG NO. D-3-2422; ISSUE; MODEL 793



NOTES

1. TRANSISTORS Q101 THRU Q110 4-1001
   Q111 THRU Q119 4-1003
2. RESISTORS R102 THRU R131 10K 10%
3. ALL DIODES CD6267 UNLESS NOTED
4. * OUTPUT CODE 1248 BCD
5. (X) P.C. TERMINATIONS

UNLESS NOTED:
ALL RESISTORS ½W. ±2% 1/4W ±5%
ALL CAPACITORS 500V. ±20%
5%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
$.001_\mu$ = μμ = 10^{-6}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG CHNG	BY	DATE
ECO 1008	GPA	6-5-62

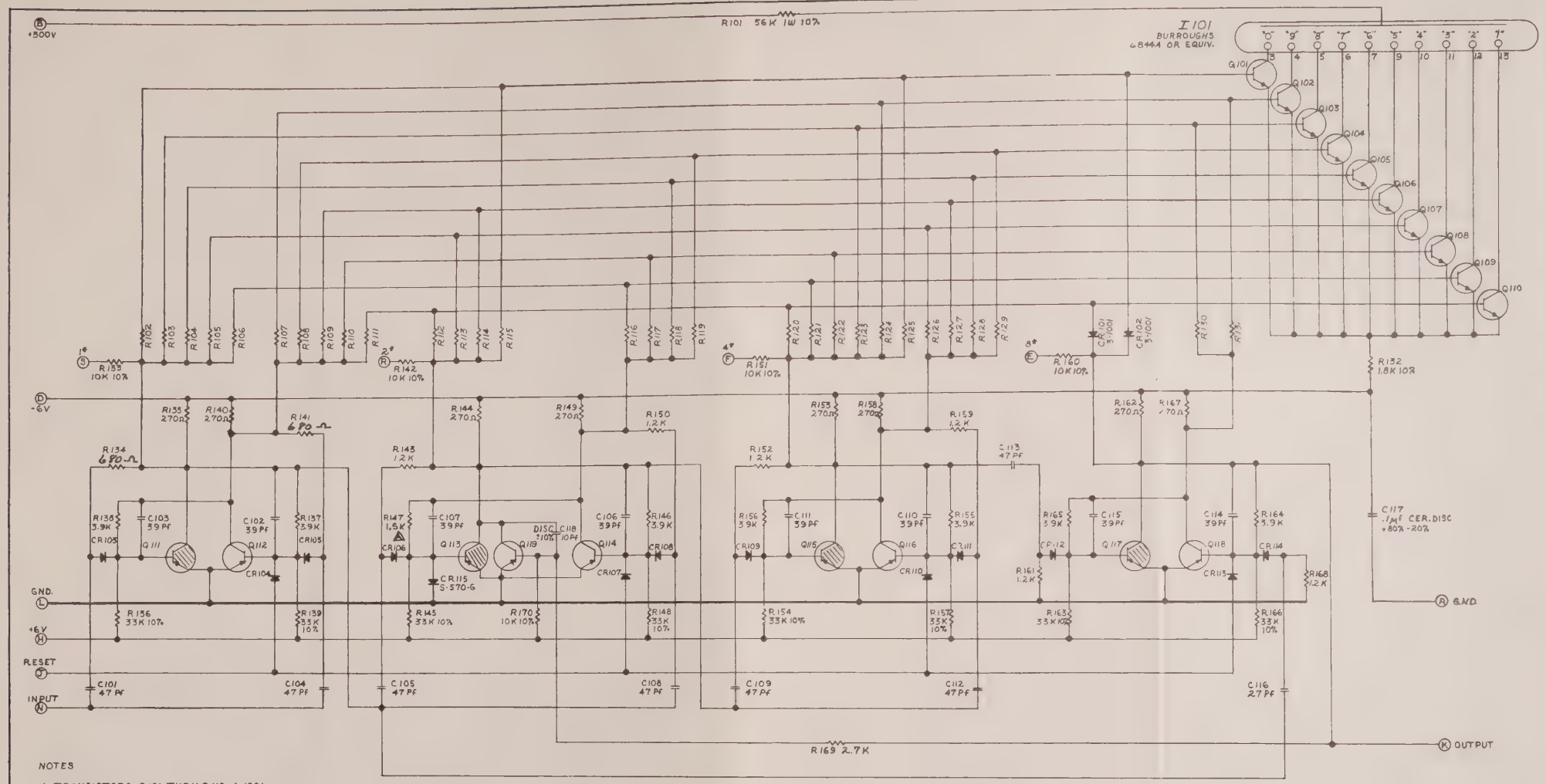
Eldorado Electronics
Berkeley, California

DRAWN BY G.H.	DATE 6-5-62
CHECKED	DATE 7-11-62
APPROVED G.P.S.	DATE 7-12-62

10MC DCU SCHEMATIC

DWG NO. D-3-2389 ISSUE B

MODEL S-714-1



NOTES

1. TRANSISTORS Q101 THRU Q110 4-1001
   Q111 THRU Q119 4-1003
2. RESISTORS R102 THRU R131 10K 10%
3. ALL DIODES CD6267 UNLESS NOTED
4. # OUTPUT CODE 1248 BCD
5. Ⓧ P.C. TERMINATIONS

UNLESS NOTED
ALL RESISTORS ¼W. ±5% ¼W ±5%
ALL CAPACITORS 100V, 5%
UNITS IN Ω, F, & H
μμ = p = 10^{-12}
.001μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG CHNG.	BY	DATE
ECO 100 B-A	GPS	9-28-62
B ECO 1091	GPS	6-3-63

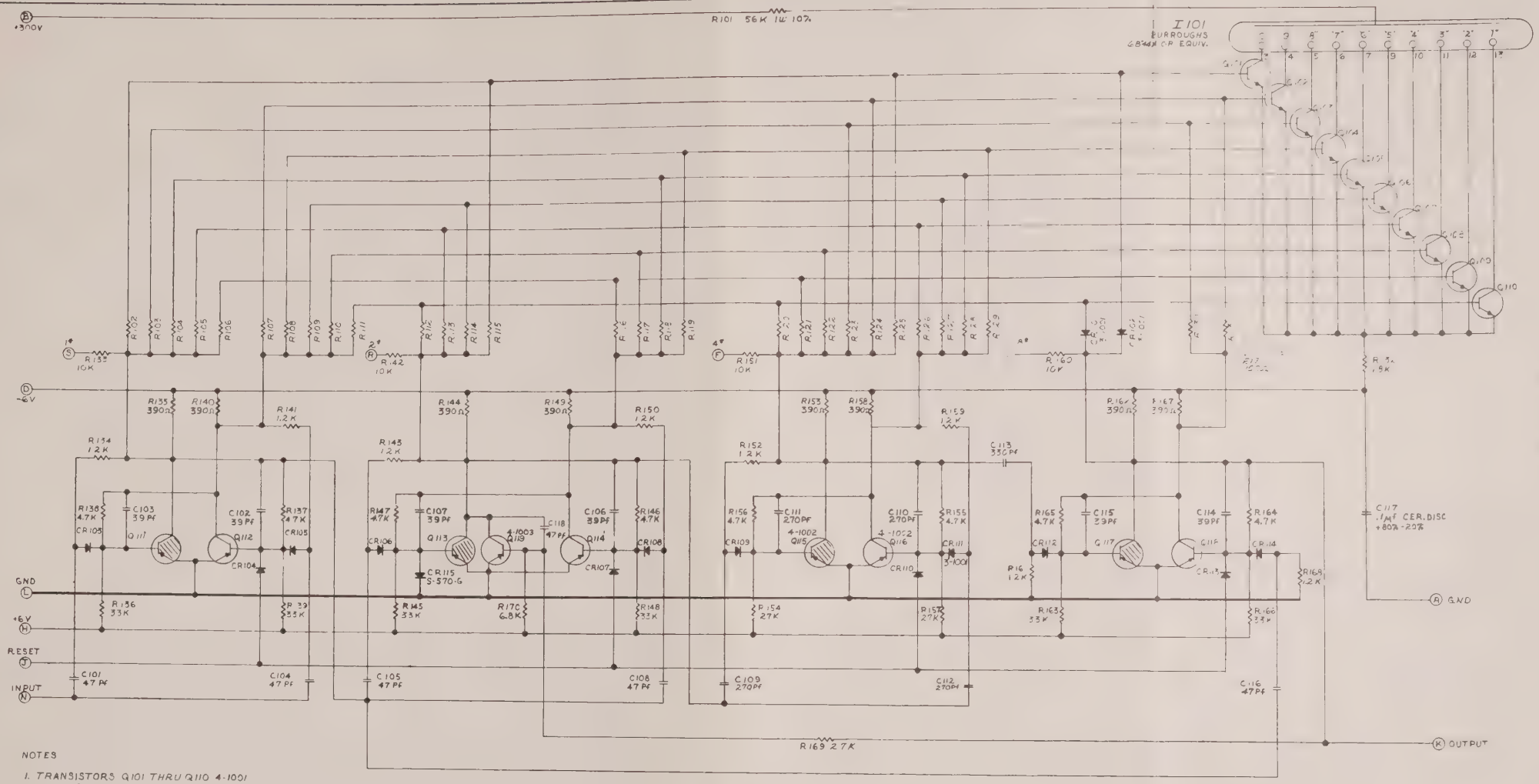
Eldorado Electronics
Berkeley, California

DRAWN BY: G.M.	DATE 6-5-62
CHECKED:	DATE 7-12-62
APPROVED: G.P.S.	DATE 7-12-62

10MC DCU SCHEMATIC

DWG NO. D-3-2392 ISSUE B

MODEL S-71A-2

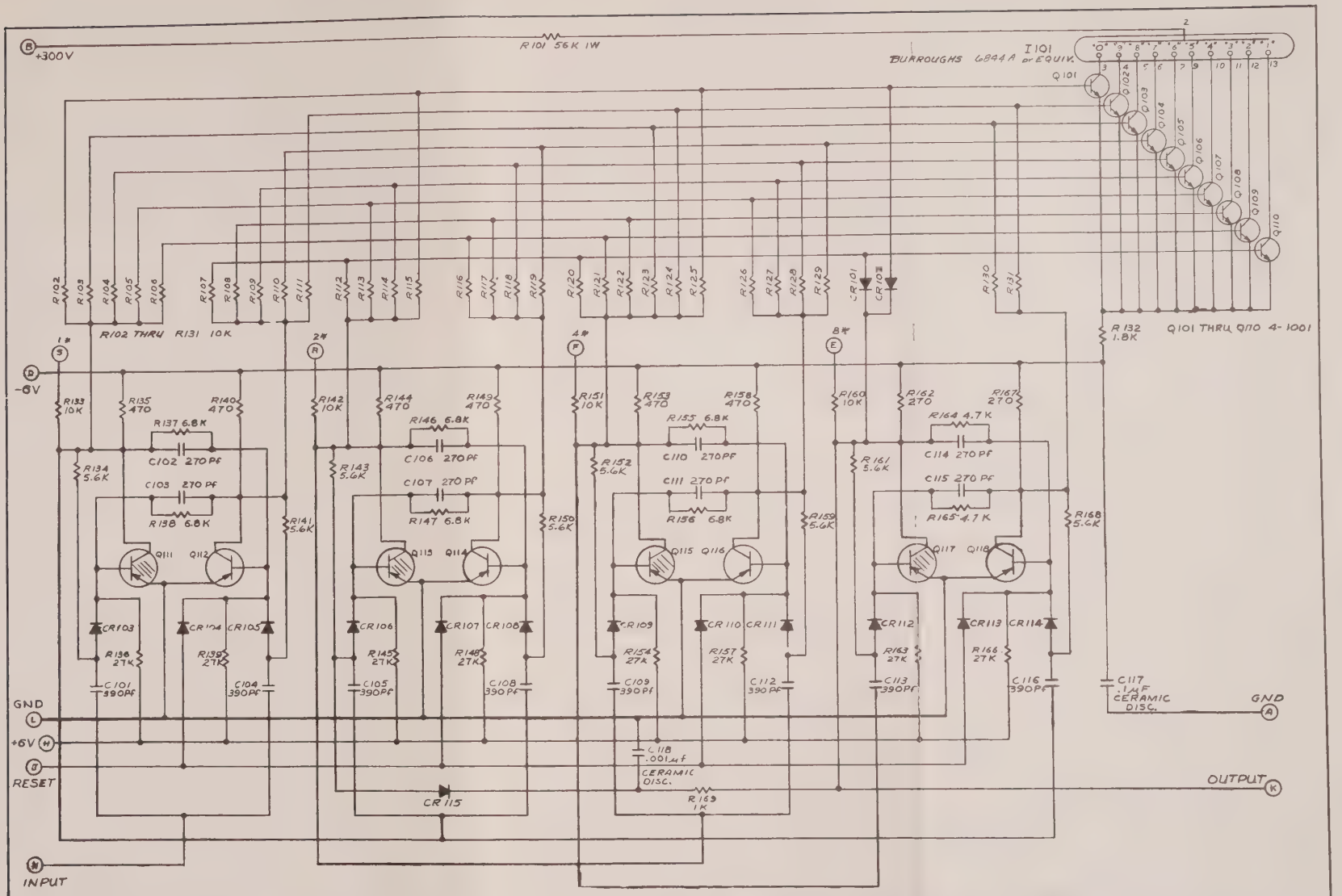


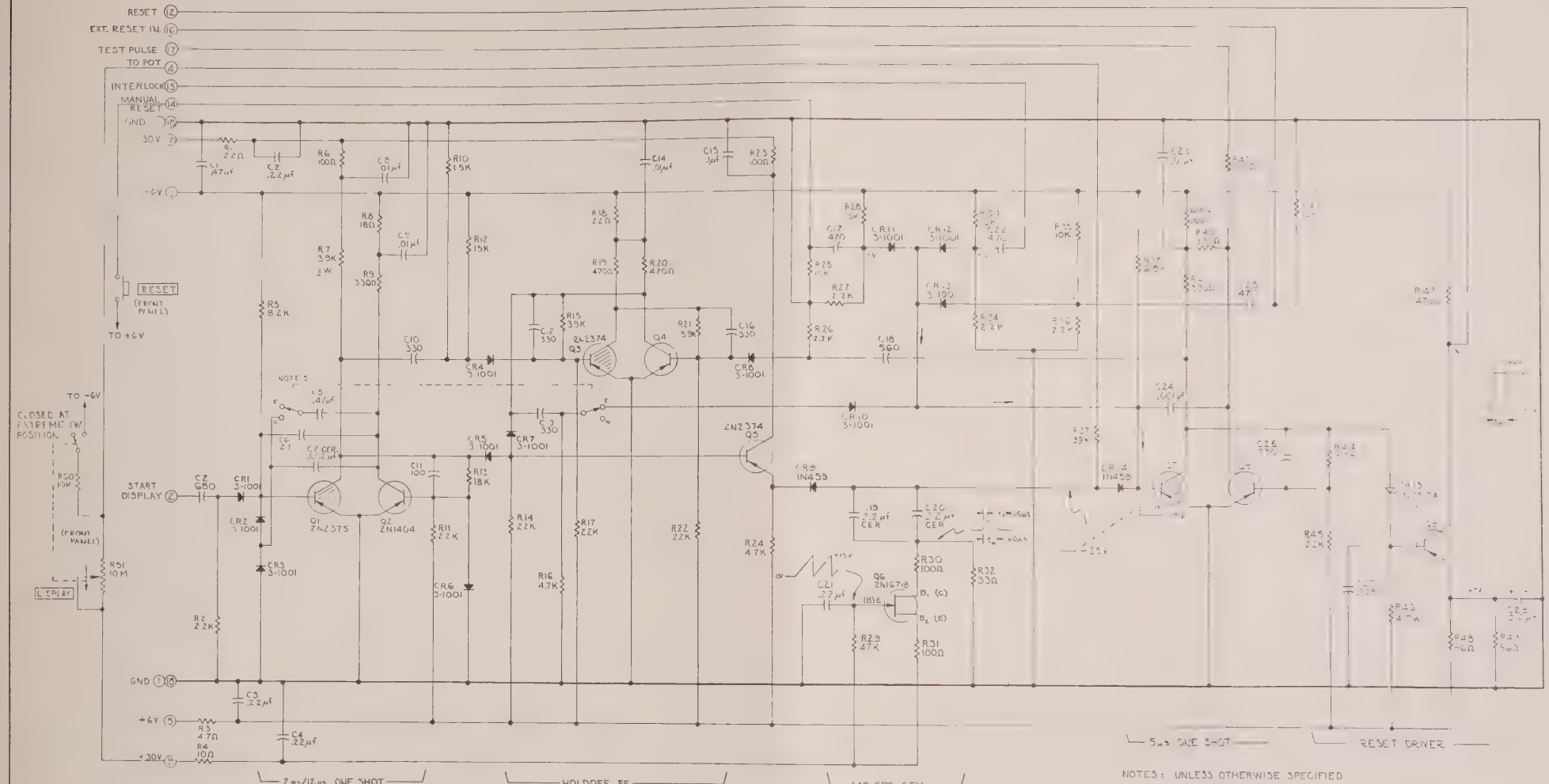
NOTES

1. TRANSISTORS Q101 THRU Q110 4-1001
   Q111 THRU Q114, Q117,118 4-1003
2. RESISTORS R102 THRU R131 10K 10%
3. ALL DIODES CD6267 UNLESS NOTED
4. # OUTPUT CODE 1248 BCD
5. (X) P.C. TERMINATIONS

UNLESS NOTED					
ALL RESISTORS [redacted] 1/4W ±5%		DWG CHNG	BY	DATE	Eldorado Electronics
ALL CAPACITORS [redacted] ±5%	A	ECO 1091	JK	6-3-63	Berkeley, California
UNITS IN Ω, F, & H	B	ECO 1110	JK	8-13-63	
.001μ = n = 10^{-9}					
μ = 10^{-6}					
m = 10^{-3}					
K = 10^{3}					
M = 10^{6}					

DRAWN BY G.M.	DATE 6-5-62	
CHECKED [redacted]	DATE 7-2-62	
APPROVED [redacted]	DATE 7-2-62	
1 MC DCU SCHEMATIC		MODEL S-724-1
DWG. NO. D-3-2395	SCALE 8	


+300V
R101 56K 1W
I101
BURROUGHS 6844A or EQUIV.
Q101 Q102 Q103 Q104 Q105 Q106 Q107 Q108 Q109 Q110
R102 R103 R104 R105 R106 R107 R108 R109 R110 R111 R112 R113 R114 R115 R116 R117 R118 R119 R120 R121 R122 R123 R124 R125 R126 R127 R128 R129 R130 R131
CR101 CR102
R102 THRU R131 10K
R132 1.8K
Q101 THRU Q110 4-1001
1#
2#
4#
8#
-6V
R133 10K
R135 470
R140 470
R137 6.8K
C102 270 PF
C103 270 PF
R138 6.8K
R134 5.6K
R141 5.6K
R142 10K
R144 470
R149 470
R146 6.8K
C106 270 PF
C107 270 PF
R147 6.8K
R143 5.6K
R150 5.6K
R151 10K
R153 470
R158 470
R155 6.8K
C110 270PF
C111 270 PF
R156 6.8K
R152 5.6K
R159 5.6K
R160 10K
R162 270
R167 270
R164 4.7K
C114 270 PF
C115 270 PF
R165 4.7K
R161 5.6K
R168 5.6K
Q111 Q112 Q113 Q114 Q115 Q116 Q117 Q118
CR103 CR104 CR105 CR106 CR107 CR108 CR109 CR110 CR111 CR112 CR113 CR114
R136 27K R139 27K R145 27K R148 27K R154 27K R157 27K R163 27K R166 27K
C101 390PF C104 390PF C105 390PF C108 390PF C109 390PF C112 390PF C113 390PF C116 390PF
C117 .1MF CERAMIC DISC.
GND
C118 .001MF CERAMIC DISC.
R169 1K
CR115
+6V
RESET
INPUT
OUTPUT
TRANSISTORS Q111 THRU Q118 4-1002
ALL DIODES 3-1001.
*OUTPUT CODE 1248 BCD
(X) P.C. TERMINATIONS
UNLESS NOTED.
ALL RESISTORS ¼W ±10%
ALL CAPACITORS
UNITS IN Q, P, & H
μμ = p = 10⁻¹²
.001μ = n = 10⁻⁹
μ = 10⁻⁶
m = 10⁻³
K = 10³
M = 10⁶
DWG. CHNG.
A ECO 1077 BY JC DATE 4-3-63
B ECO 1113 BY KF DATE 8-13-63
Eldorado Electronics
Berkeley, California
DRAWN BY: JAV DATE 12-8-61
CHECKED: DATE 12-18-61
APPROVED: DATE 12-18-61
100 KC DCU SCHEMATIC
DWG. NO. C-3-1253 ISSUE B
MODEL S-73



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ¼W, ±5%
2. ALL CAPACITOR VALUES IN PICAFARADS, 300V, ±5%
3. ALL TRANSISTORS 2N1404
4. (X) REFERS TO PCB CONNECTOR PIN DESIGNATION
5. F = FAST RECYCLE ~10 KC (UP)
   N = NORMAL (DOWN)

10-2064

FINISH	DWG CHNG	BY	DATE
	ECC 50	D	7-15-63
MATERIAL			
TOLERANCE UNLESS NOTED ± .00 = .015 .000 = .005	HOLE DIA .005 ANGLES 1°		

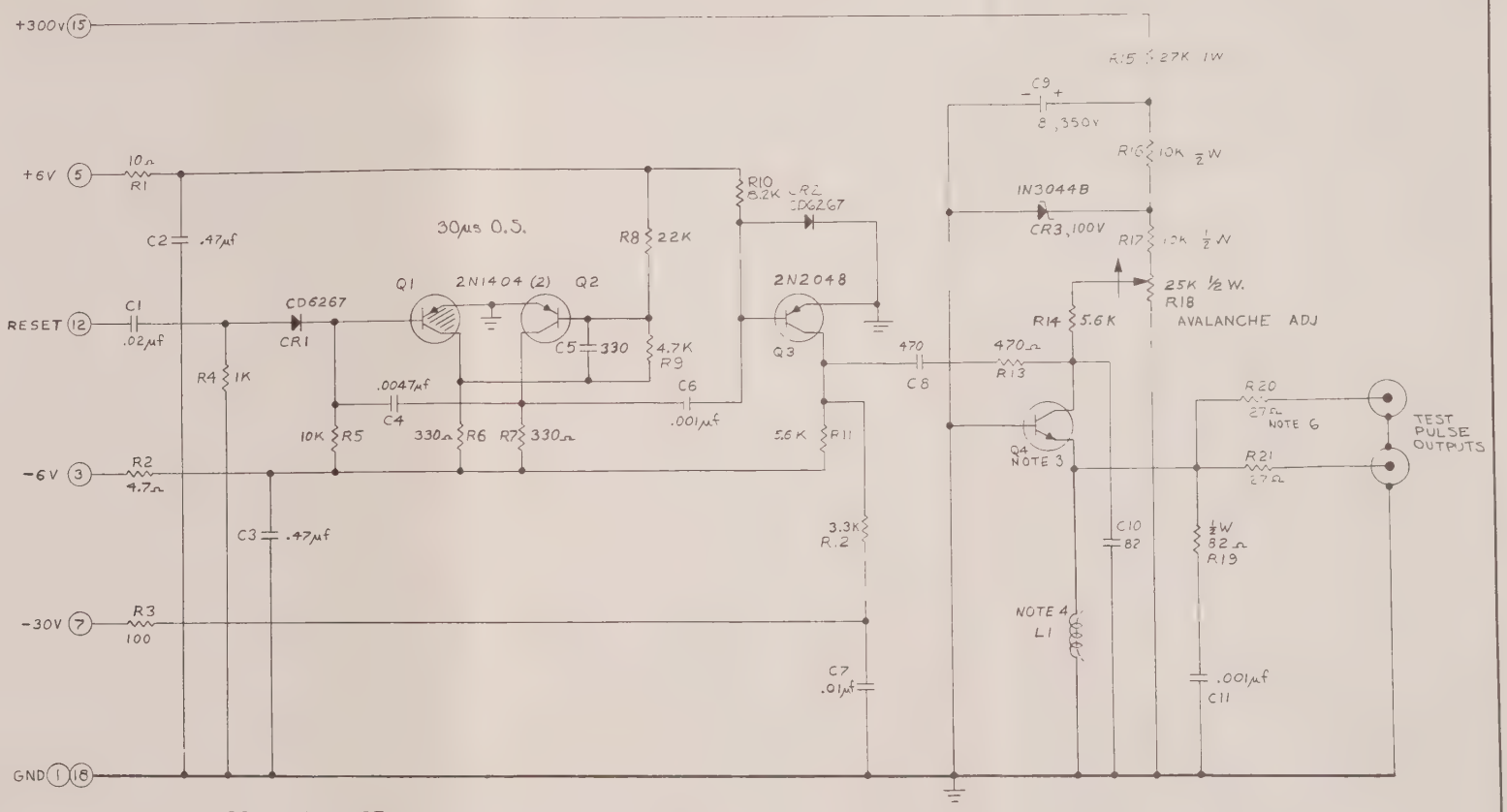
Eldorado Electronics
Berkeley, California

DRAWN BY S. STARR	DATE 5-3-63	DO NOT SCALE THIS DRAWING
CHECKED	DATE 10-11-63	
APPROVED	DATE	SCALE

RESET CIRCUIT

DWG NO 5-3-2432 ISSUE A

MODEL 33



NOTE : UNLESS OTHERWISE SPECIFIED

1. ALL RESISTOR VALUES IN OHMS, ±5%, ¼W
2. ALL CAPACITOR VALUES IN MICROFARADS, ±5%, 300V.
3. Q4 ; SELECT AMONG 2N636A, 2N635A, 2N634A FOR AVALANCHE
4. FERROXCUBE 208 F 125/3D3 TOROIDAL CORE WOUND WITH 15 TURNS OF #26 NYCLAD WIRE
5. (X) REFERS TO PCB CONNECTOR PIN DESIGNATION
6. NOMINAL 27Ω, FINAL VALUE DETERMINED PER AVALANCHE CHARACTERISTICS

R	C	CR	Q	L
R21	C11	CR3	Q4	L1

UNLESS NOTED
ALL RESISTORS ½ W. ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
001 μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG. CHNG	BY	DATE

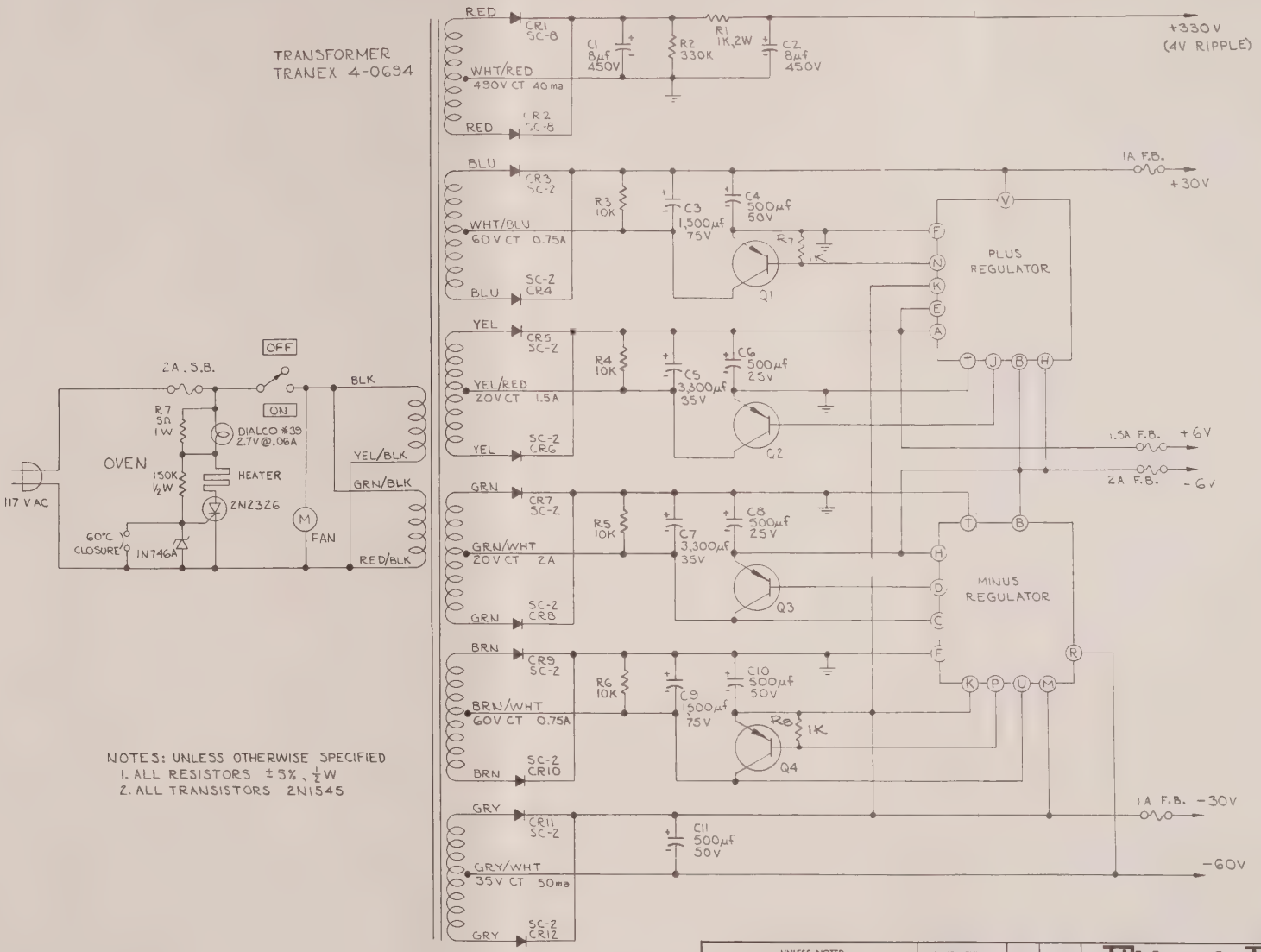
Eldorado Electronics
Berkeley, California

DRAWN BY: R.P.	DATE 8-19-63
CHECKED: M.J. Fisher	DATE 8-25-63
APPROVED: J.R.Y.	DATE

SCHEMATIC DIA.
TEST PULSER

DWG. NO. C-3-2375 ISSUE

MODEL 793



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ±5%, ½W
2. ALL TRANSISTORS 2N1545

R	C	CR	Q
8	11	12	4

UNLESS NOTED.
ALL RESISTORS ½W. ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
µµ = p = 10^{-12}
.001µ = n = 10^{-9}
µ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG CHNG	BY	DATE
ECO 1183	DCP	1-9-64

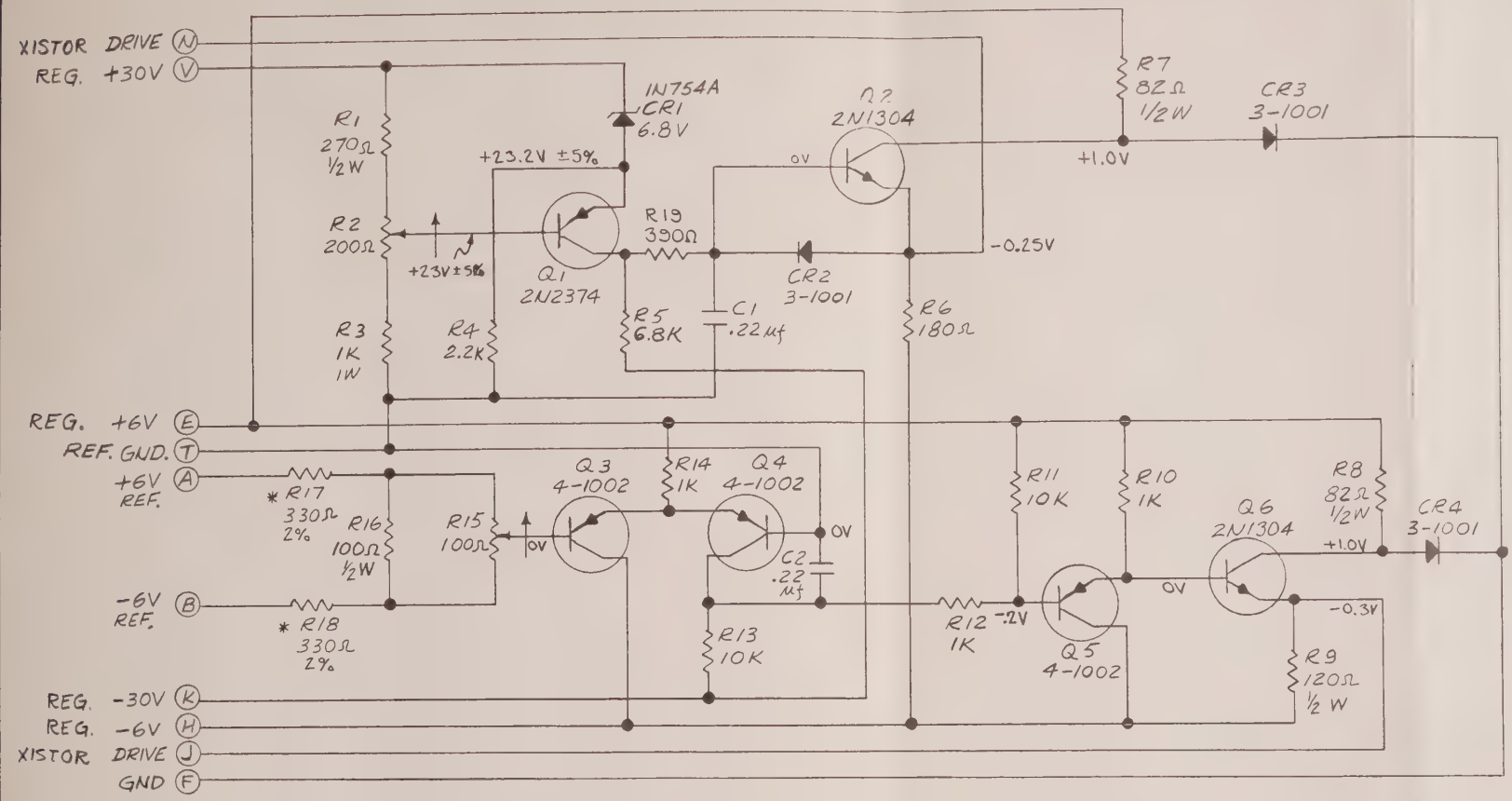
Eldorado Electronics
Berkeley, California

DRAWN BY: G. STARR	DATE 11-14-63
CHECKED:	DATE 11-20-63
APPROVED:	DATE

793 POWER SUPPLY

DWG. NO. C-3-2616 ISSUE A

MODEL 793



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE ¼ W. 5 %.
2. ALL CAPACITORS ARE 50 V. %.
3. ○ REFERS TO PCB CONNECTOR DESIGNATION
4. * CORNING TYPE 20 RESISTOR
5. VOLTAGES ARE WITHIN ±0.15 VOLTS

Q	R	CR	C
6	19	4	2

FINISH	DWG. CHNG.	BY	DATE
MATERIAL			
TOLERANCE UNLESS NOTED ± .00 = .015 .000 = .005 HOLE DIA. .005 ANGLES 1°			

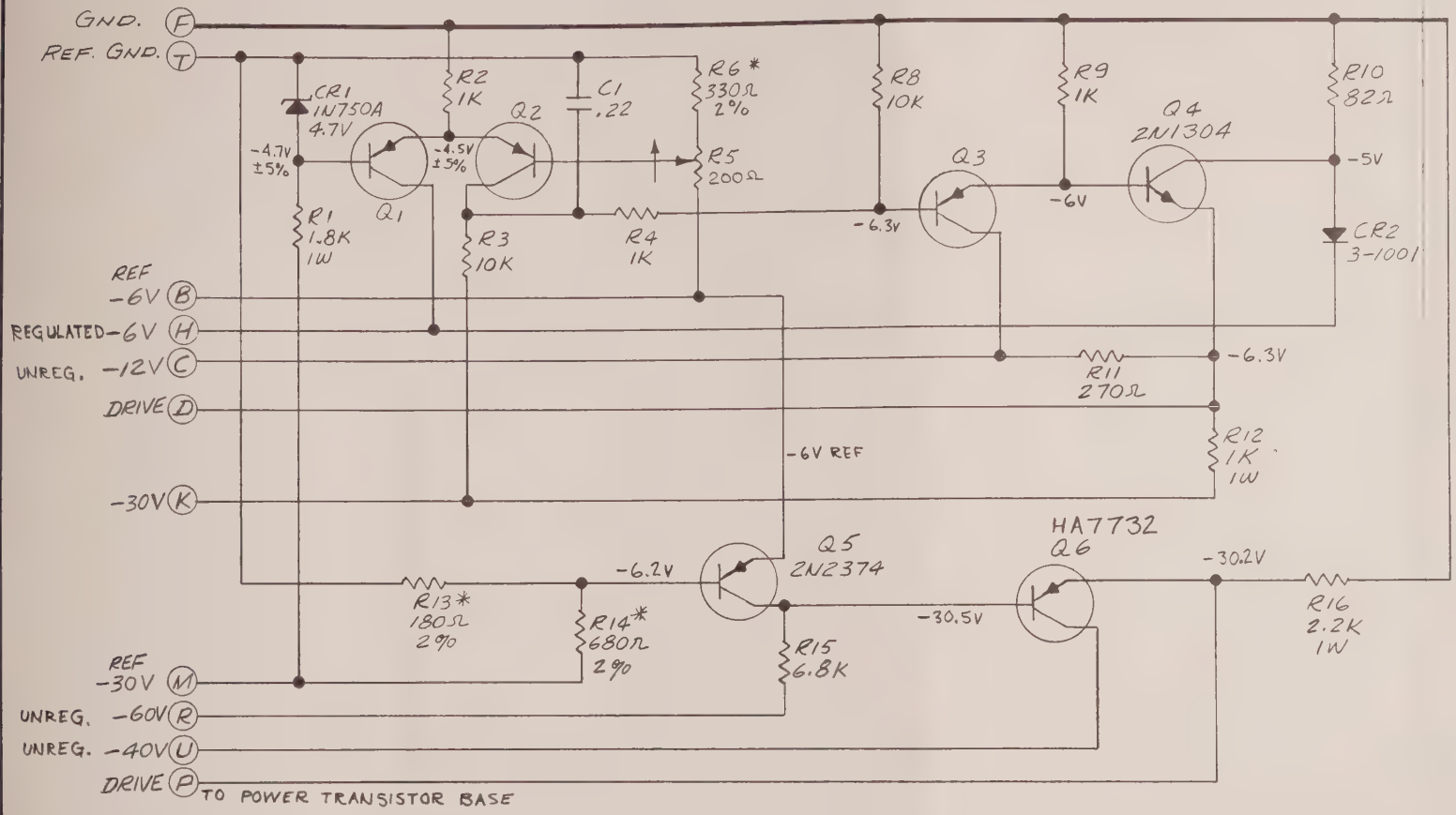
Eldorado Electronics
Berkeley, California

DRAWN BY: S.F.	DATE 8-23-63	DO NOT SCALE THIS DRAWING.
CHECKED: [illegible]	DATE 8-30-63	
APPROVED: RCE	DATE 12/26/63	SCALE:

PLUS REGULATOR

DWG. NO. B-3-2247 ISSUE

MODEL 793



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL TRANSISTORS ARE 4-1002
2. ALL RESISTORS ARE ¼ W. 5 %.
3. * CORNING TYPE 20 RESISTOR
4. ○ REFERS TO PCB CONNECTOR DESIGNATION.
5. VOLTAGES ARE MEASURED WITH SUPPLY ADJUSTED TO ±2%. VALUES ARE WITHIN 0.15 VOLTS

Q	R	CR	C
6	16	2	1

FINISH

MATERIAL

TOLERANCE UNLESS NOTED ±
.00 = .015 HOLE DIA. .005
.000 = .005 ANGLES 1°

DWG. CHNG.	BY	DATE
ECO 1150	R.S.	11-11-63

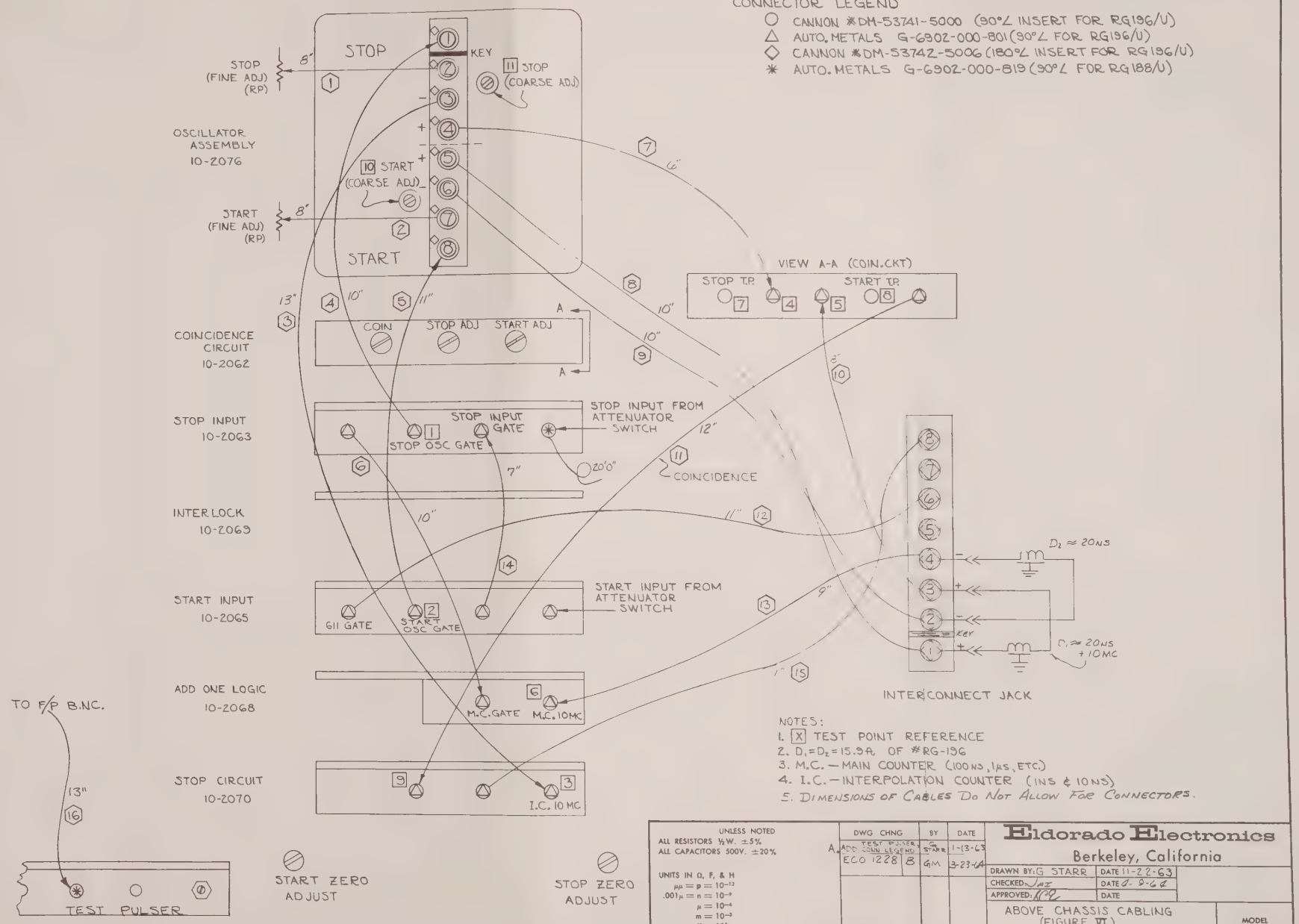
Eldorado Electronics
Berkeley, California

DRAWN BY: S. F.	DATE 8-15-63	DO NOT SCALE THIS DRAWING.
CHECKED: VJ in Turn	DATE 3-22-63	
APPROVED: RCE	DATE 12/26/63	SCALE:

MINUS REGULATOR

DWG. NO. B-3-2246 ISSUE A

MODEL 793/611



NOTES:
1. [X] TEST POINT REFERENCE
2. $D_1 = D_2 = 15.9\Omega$ OF #RG-196
3. M.C. — MAIN COUNTER (100NS, 1μS, ETC.)
4. I.C. — INTERPOLATION COUNTER (1NS & 10NS)
5. DIMENSIONS OF CABLES DO NOT ALLOW FOR CONNECTORS.

UNLESS NOTED
ALL RESISTORS ½W. ±5%
ALL CAPACITORS 500V. ±20%

UNITS IN Ω, F, & H
μμ = p = 10^{-12}
.001μ = n = 10^{-9}
μ = 10^{-6}
m = 10^{-3}
K = 10^{3}
M = 10^{6}

DWG CHNG		BY	DATE
A ADD TEST PULSER, ADD CONN LEGEND ECO 1228	B	G STARR GM	1-13-63 3-23-64

Eldorado Electronics
Berkeley, California

DRAWN BY: G STARR — DATE 11-22-63
CHECKED: JAI — DATE 8-9-64
APPROVED: [illegible] — DATE

ABOVE CHASSIS CABLING (FIGURE VI)

DWG. NO. C-2-2617 — ISSUE B

MODEL 793

MODEL 793A TIME INTERVAL COUNTER

PRINTER CABLE CONNECTIONS (AMPHENOL 57-40500)

DIGIT	PIN CONNECTIONS			
	1	2	4	8
10^0*	1	2	26	27
10^1	3	4	28	29
10^2	5	6	30	31
10^3	7	8	32	33
10^4	9	10	34	35
10^5	11	12	36	37
10^6	13	14	38	39
10^7	15	16	40	41
10^8	17	18	42	43
10^9	19	20	44	45

10^0 * Corresponds to 1 nanosecond position

Print Command ------ Pin 23

Serial No. 126 & Later
Pin No. 25 & 50 Ground
Pin No. 46 + 300 v
Pin No. 20 + 30 v
Pin No. 19 + 6
Pin No. 44 - 6
Pin No. 45 - 30
Pin No. 21 Reset

WARRANTY

Eldorado instruments are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. This warranty does not apply to vacuum tubes or transistors, except as they are warranted by their manufacturers. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer at his expense (see Repairs) during such period and which has not been subjected to misuse, neglect, improper installation, repair, alteration, or accident. Seller shall have the right of final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warranty is in lieu of any other warranty, express, implied, or statutory, and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

RECEIVING INSPECTION

Every Eldorado instrument is carefully inspected and is in perfect working order at the time of shipment. Each instrument should be checked as soon as received. If the unit is damaged in any way or fails to operate, a claim should immediately be filed with the transportation company.

REPAIRS

When an Eldorado instrument requires service, the nearest Eldorado representative should be contacted; all representatives will provide immediate service or arrange factory returns when necessary. In the latter case, the instrument must be dispatched freight prepaid, with insurance coverage arranged by the customer. Freight and insurance on the return trip to the customer will be arranged by Eldorado and charged to the customer.

SHIPPING DAMAGES

In any case where damage occurs in transit, Eldorado's obligations under warranty are dependent on the customer's immediately notifying the carrier, so that inspection can be made and a claim filed.

Please specify both model and serial number in all correspondence concerning Eldorado instruments. Address all inquiries regarding Eldorado instruments to your nearest sales representative or Sales Manager, Eldorado Electronics Company, 601 Chalomar Road, Concord, California (94520).

MP MASTER
MA29722